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The GEOGRAPHICAL JOURNAL

Vol LXXVI No 6 — R.G.S. — *December 1930*

THE CENTENARY CELEBRATIONS 21–23 OCTOBER 1930

THE ceremonies which had been planned to celebrate the Centenary of our Society's foundation, and at the same time to open and bring into use the new buildings which have been added to the original Lowther Lodge during the last fifteen months, were performed in accordance with the programme announced; and the Society at the age of one hundred years stands possessed of a home worthy of its traditions and well designed for its manifold activities. The eloquent addresses brought by the Delegates from kindred Societies and Institutions at home and abroad assure our Society formally of their respect and good will: but what is more, our guests were so good as to find in their reception and entertainment an air of genuine friendship. So on their taking leave they cordially asserted, making of our celebrations a happy occasion for ensuring amity and forgetting differences, one with another as with ourselves.

THE INAUGURAL MEETING: October 21 at 3.0 p.m.

The Delegates were seated according to the seniority of the Societies and Institutions which they represented, and the Hall was filled to its capacity with Fellows of the Society.

His Royal Highness the Duke of York was received at the entrance to the Hall and conducted to the new Council Room, where the officers of the Society were presented, and attended the Duke to the dais in the Hall.

At the opening of the proceedings the PRESIDENT said: I have been instructed by His Royal Highness to read the translation of a telegram which has been received from His Majesty the King of the Belgians:

> "On the occasion of the Centenary of the Royal Geographical Society I address to the Fellows of your illustrious Society my congratulations and good wishes as well as the expression of my admiration for the scientific labours which during the course of these hundred years have marked its activities."

To that gracious telegram we are sending this reply:

> "The Royal Geographical Society assembled for the celebration of their Centenary beg leave to express their grateful thanks to His Majesty the King of the Belgians for his gracious message, which is deeply appreciated by the Society."

The PRESIDENT then addressed the Duke of York in these words:

May it please Your Royal Highness—

We, the Council and Fellows of the Royal Geographical Society, desire to tender our respectful thanks to Your Royal Highness for presiding, as representative of His Majesty the King, our Patron, at this inauguration of the celebration of the Centenary of the Society; and we ask Your Royal Highness graciously to transmit to the King the assurance of our devotion to His Majesty and of our gratitude to His Royal House for the beneficent patronage extended to the Society during the past hundred years.

One hundred years ago His Majesty King William IV became the Founder and Patron of the Society, and since that date the same honour of patronage has been conferred on the Society by each sovereign in succession—by Queen Victoria, by King Edward VII, and by His present Majesty King George V, who, when Prince of Wales, was our Vice-Patron, as is now His Royal Highness the Prince of Wales to-day.

With the approval of the King, our Patron, it was decided that our Centenary Celebrations should be signalized by the opening of the new Hall in which we are now assembled, and of our new Library, Map Room, and Council Room. The building of these important additions to the Society's House has been rendered possible by the subscriptions of many hundreds of our Fellows; but, in saying this, we do not forget that the scheme was brought into existence by the foresight and energy of the late Marquess Curzon of Kedleston, who, when President, obtained from generous benefactors the means to purchase the original house and grounds. It was Lord Curzon who proposed the building of the Hall and suggested the sale of the surplus land, in order to provide much of the money required, in the manner actually carried out. Major Darwin, an earlier President, had inaugurated a building fund and had urged the importance of erecting a Hall for our meetings, dedicated to the memory of British explorers. And we do not forget that it is to the late Dr. D. G. Hogarth that we owe the suggestion, made when he was President, of the building of a Library worthy of the Society. To carry the whole matter to completion we appealed to the benevolence of our present Fellows, and we thank all who have contributed, especially bringing to notice the munificence of Dr. and Mrs. Hamilton Rice, Mr. S. A. Courtauld, Mr. A. S. Vernay, Sir Otto Beit, Mr. W. A. Cadbury, Mrs. Cuthbert, and Mrs. Patrick Ness, and the anonymous donor of a gift in memory of Mr. Yates Thompson.

This Society is the third of the great Geographical Societies of the world to celebrate its centenary. In 1921 the Société de Géographie of Paris and in 1928 the Gesellschaft für Erdkunde of Berlin completed their first hundred years. We are very glad to welcome here, and desire to present first to Your Royal Highness, the distinguished men of science who have been appointed to represent these two senior societies, namely, Dr. Jean Charcot of Paris and Professor Albrecht Penck of Berlin.

And we are also honoured to-day by the presence of many delegates from the Geographical Societies which have come into existence since our own, and from kindred institutions in foreign countries, in the British Dominions and Colonies, and in our own land, who now join with us in celebrating this happy occasion. Their attendance indicates the excellent relations that subsist

between those who are devoted to our group of studies and especially between the members of the various societies concerned. All these delegates we desire to present to Your Royal Highness.

The delegates from these societies and institutions have honoured us by bringing with them addresses of congratulation. With Your Royal Highness's permission we will now proceed with the presentation of these addresses to You, Sir, as representing His Majesty, the Patron and Head of our Society.

The Foreign Secretary (Sir Maurice de Bunsen) then presented to His Royal Highness the Delegates of Foreign Societies and Institutions. The senior Delegate of the Société de Géographie, Dr. Charcot, read an Address of Congratulation and tendered with it a Gold Medal struck in honour of the occasion; with him were General Perrier and M. Guillaume Grandidier.

The senior Delegate of the Gesellschaft für Erdkunde, Geh. Reg. Professor Dr. Albrecht Penck, then read the Address from the Berlin Society: with him were Professor Dr. Norbert Krebs and Dr. Haushofer.

The Delegates of the other foreign Societies and Institutions were then presented in order, and handed to the Duke of York the Addresses of Congratulation and gifts with which they were charged.

I. DELEGATES OF FOREIGN GEOGRAPHICAL SOCIETIES *in the order of their foundation*

Paris	Société de Géographie (1821)	Dr. Charcot Général Perrier M. Grandidier
Berlin	Gesellschaft für Erdkunde (1828)	Geh. Reg. Prof. Dr. A. Penck Prof. Dr. Norbert Krebs Dr. A. Haushofer
Mexico City	Sociedad Mexicana de Geografia y Estadistica (1839)	Hon. Francisco Leon de la Barra
St. Petersburgh	Gosudarstvennoe Russkoe Geograficheskoe Obshchestvo (1845)	Dr. Hugh Robert Mill
New York City	American Geographical Society (1852)	Prof. A. P. Brigham Mr. H. Stuart Hotchkiss
Wien	Geographische Gesellschaft in Wien (1856)	Hofrat Prof. Dr. Eugen Oberhummer
Roma	Reale Societa Geografica Italiana (1867)	Cav. Filippo De Filippi Prof. R. Almagià
München	Geographische Gesellschaft in München (1869)	Dr. E. von Drygalski
Budapest	Magyar Földrajzi Társaság (1872)	Count Paul Teleki
Bern	Geographische Gesellschaft (1873)	Major Hanns Vischer
Amsterdam	K. Nederlandsch Aardrijkskundig Genootschap (1873)	Dr. E. John Voûte
Paris	Société de Géographie Commerciale (1873)	Dr. Y. M. Goblet
Hamburg	Geographische Gesellschaft (1873) and Deutsche Seewarte	Prof. Dr. Bruno Schulz
Bucureşti	Societatea Regală Română de Geografie (1875)	Mons. C. M. Laptew

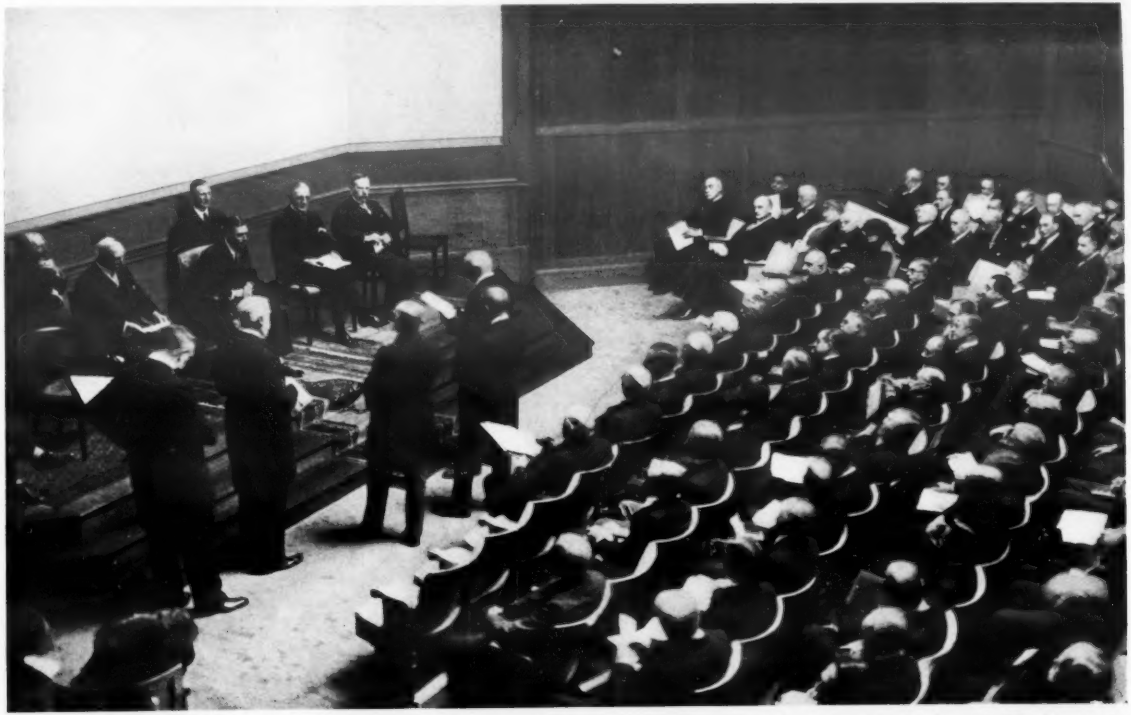
Cairo	Société Royale de Géographie d'Egypte (1875)	Dr. W. F. Hume
Madrid	Real Sociedad Geográfica (1876) and Instituto Oceanográfico	Prof. Odón de Buen
Bruxelles	Société Royale Belge de Géographie (1876) and Service Cartographique du Ministère des Colonies	M. Maury
Kjöbenhavn	Kongelige Danske Geografiske Selskab (1876)	Prof. M. Vahl
Anvers	Société Royale de Géographie d'Anvers (1876)	Maître Maurice de Cock
Stockholm	Svenska Sällskapet for Antropologi och Geografi (1877)	Prof. Axel Wallen
Tōkyō	Chigaku-Kyōkwai (1879)	Mr. Y. Hori
Neuchâtel	Société Neuchâteloise de Géographie (1885)	Prof. Ch. Biermann
Washington	National Geographic Society (1888)	H.E. the American Ambassador
Lima	Sociedad Geografica de Lima (1888)	Sr. Carlos A. Mackehenie
Oslo	Norske Geografiske Selskab (1889)	Dr. Anton Mohr
Philadelphia	Geographical Society (1892)	Dr. Hugh Robert Mill
Chicago	Chicago Geographical Society (1894)	Mr. Carveth Wells
Nashville	Association of American Geographers (1904)	Mr. Alan Ogilvie
Beograd	Geografsko Društvo (1910)	Prof. D. Subotić
Warszawa	Polskie Towarzystwo Geograficzne (1917) and Wojskowy Instytut Geograficzny	Prof. Jerzy Loth Prof. Stanislas Nowakowski
Paris	Association de Géographes Français (1920)	M. Emmanuel de Margerie
Buenos Aires	Sociedad Argentina de Estudios Geograficos (1922)	H.E. the Argentine Ambassador
Peiping	Chung-kuo Ti-hsüeh Hui	Mr. T. T. Chang

II. DELEGATES OF STATE GEOGRAPHICAL INSTITUTES *in alphabetical order of States represented*

Argentine R.	Instituto Geografico Militar, Buenos Aires	Lt.-Col. S. A. Casares
Chile	Oficina de Mensura de Tierras, Santiago	Dr. Tomás de la Barra
Czechoslovakia	Geografický ústav Karlovy University, Praha	Prof. Dr. V. Švambera
France	Service Géographique de l'Armée, Paris	Col. de Lavalette du Coetlosquet
Poland	Instytut Geograficzny, Lwów	Prof. Eugenjusz Romer

The Foreign Secretary then presented these four Gold Medallists of the Society who had accepted personal invitations to be present:

Dr. Hamilton Rice (Patron's Medal 1914)
Le Général Bourgeois (Patron's Medal 1921)
Dr. Lauge Koch (Patron's Medal 1927)
Mr. Carsten Borchgrevink (Patron's Medal 1930)



The Delegation of the Société de Géographie reading their Address to H.R.H. the Duke of York at the Inaugural Meeting in the New Hall of the Society

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Mr. Douglas Freshfield reading his address on the History of the Society at the Centenary Meeting

The Senior Honorary Secretary (Brigadier E. M. Jack) then presented in order the Delegates from the British Dominions and Colonies, and of British kindred Societies and Institutions.

III. DELEGATES OF BRITISH DOMINION AND COLONIAL GEOGRAPHICAL SOCIETIES AND SURVEY DEPARTMENTS

Australia	Royal Geographical Society of Australasia, Queensland Branch, Brisbane (1885)	The Most Rev. Gerald Sharp, Archbishop of Brisbane
Australia	Royal Geographical Society of Australasia, South Australian Branch, Adelaide (1885)	Mr. Edward Whewall Holden
India	Himalayan Club, Simla (1928)	Sir Geoffrey Corbett
Canada	Canadian Geographical Society, Ottawa (1930)	Dr. Charles Camsell
India	Survey of India, Calcutta	Major W. J. Norman
Ceylon	The Survey Department of Ceylon, Colombo	Mr. J. K. Clegg
Gold Coast	Survey Department, Accra	Capt. S. C. Saward
Nigeria	Survey Department, Lagos	Mr. F. E. Tavener
Rhodesia	Survey Department, Livingstone	Mr. R. T. Hockey

IV. DELEGATES OF BRITISH KINDRED SOCIETIES AND INSTITUTIONS *in the order of their foundation*

University of Oxford	Prof. J. L. Myres
University of Cambridge	Mr. F. Debenham
Royal Society (1662)	Col. Sir Henry Lyons
Society of Antiquaries (1707)	Mr. C. R. Peers
British Museum (1753)	Lt.-Col. Sir David Prain
Royal Society of Edinburgh (1783)	Prof. D'Arcy W. Thompson
Linnean Society (1788)	Sir Sidney Harmer
Royal Institution (1799)	Dr. G. C. Simpson
Royal Horticultural Society (1804)	Mr. Gerald Loder
Geological Society (1807) and University of London (1836)	Prof. E. J. Garwood
School of Military Engineering, Chatham (1812)	Major P. K. Boulnois
Institution of Civil Engineers (1818)	Mr. W. W. Grierson
Royal Astronomical Society (1820)	Dr. A. C. D. Crommelin
Royal Asiatic Society (1823)	The Marquess of Zetland
Zoological Society (1829)	Sir Peter Chalmers Mitchell
British Association (1831)	Mr. O. J. R. Howarth
Royal Meteorological Society (1850)	Mr. R. G. K. Lempfert
Victoria and Albert Museum (1853)	Mr. Eric Maclagan
Alpine Club (1858)	Dr. Claude Wilson
Royal Empire Society (1868)	Col. Weston-Jarvis
Institution of Electrical Engineers (1871)	Lt.-Col. K. Edgcumbe
Royal Scottish Geographical Society (1884)	The Lord Elphinstone
Manchester Geographical Society (1884)	Col. H. T. Crook
Imperial Institute (1890)	Lt.-Gen. Sir William Furse and Mr. Harold Brown
Geographical Association (1893)	Mr. B. Bentham Dickinson

Mr. Douglas Freshfield reading his address on the History of the Society at the Centenary Meeting

Liverpool Geographical Society (1893)	Mr. James D. Barker
British Academy (1901)	Prof. Sir Charles Oman
Imperial College of Science and Technology (1907)	Mr. H. T. Tizard

H.R.H. THE DUKE OF YORK then spoke as follows:

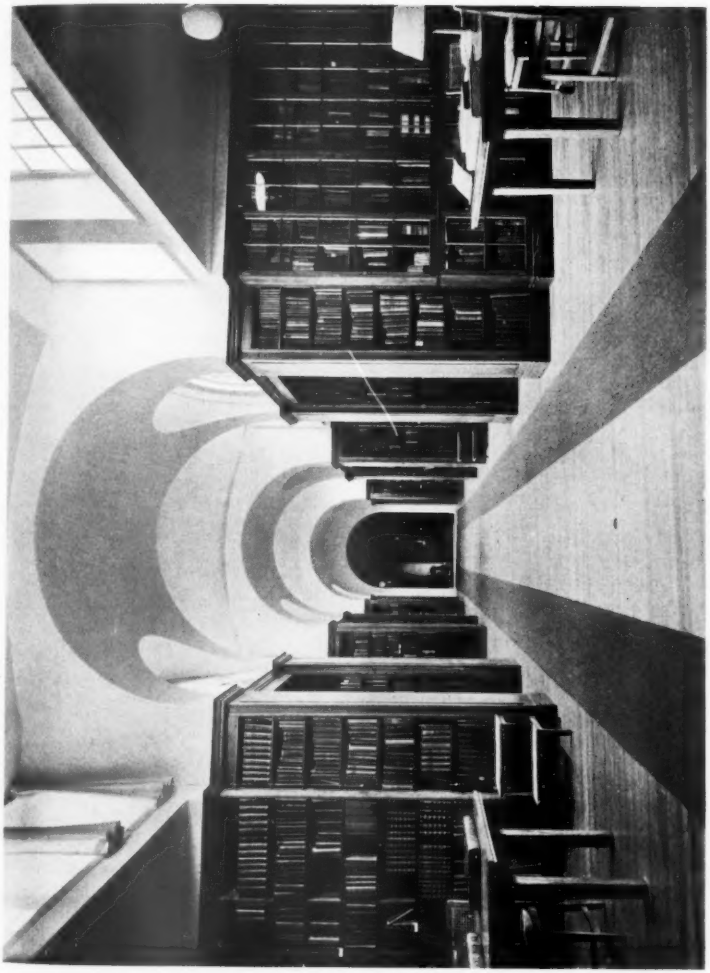
Mr. President and Fellows of the Royal Geographical Society,—I am very glad to have this opportunity of coming here this afternoon on behalf of the King, my father, to inaugurate the celebrations of the Centenary of the Royal Geographical Society, and I will not fail to convey to His Majesty your expressions of loyalty and gratitude.

I have been especially pleased to have this opportunity of receiving the delegates of those kindred societies who have so kindly come to London to express their congratulations and good wishes on this great occasion. These delegates include representatives of those two important geographical societies, in Paris and in Berlin, which are senior to our own. I cordially thank these gentlemen and the other delegates for the addresses they have delivered and which so worthily express the sentiments animating all who are gathered here this afternoon. In the name of the King, I thank all those who have come here to do honour to the Society. His Majesty will, I know, be especially interested to learn of the presence here of so many foreign recipients of the Royal Medals given annually by the Patron to mark the Society's appreciation of distinguished work. It is a matter of deep and universal regret that death has deprived us of the presence of one great man whom we had hoped to have with us—Dr. Nansen.

We are in the happy position of now celebrating the first hundred years of the Society's successful activity and are inaugurating another century by opening these fine buildings erected through the generosity of two generations of benefactors. I hope that others will be stimulated by this achievement, and that further gifts will provide the means to pursue in all the fields of exploration and research that work which is the Society's duty to its Fellows and to the country. I now declare the Hall and the other buildings open.

Admiral Sir WILLIAM GOODENOUGH (President Elect) then said: Six thousand four hundred Fellows of the Royal Geographical Society, of whom I am the mouthpiece, ask Your Royal Highness to accept their most sincere and heartfelt thanks for your presence here to-day and for coming here to represent His Majesty to inaugurate our celebrations and to declare this Hall and its adjoining buildings open. In them Your Royal Highness sees the fulfilment of an aspiration of one hundred years, and I may assure Your Royal Highness that His Majesty's commands and Your Royal Highness' presence here to-day will encourage us in further aspirations in geography in all its branches; a science, Sir, without which mankind can make no progress.

At the conclusion of the ceremony the President presented the Architects, Messrs. George Kennedy and F. B. Nightingale, and the Contractors, the Hon. Roland Cubitt and Mr. Derek Hannen. He then conducted the Duke of York through the new Ambulatory, Map Room, and Library to the Council Room, where further presentations were made. His Royal Highness then



The New Library, looking west

UNIV. OF MICH.

The Map Room

passed through the company assembled in the Ambulatory and Museum and was attended to the door by the President and officers.

The Delegates appointed by the Istituto Geografico Militare (General Vacchelli), the Sociedad Geografica de la Pas (Dr. Don Arthur Posnansky), the Sociedad Chilena de Historia y Geografia (Señor Agustin Edwards), the Touring Club Italiano (Major Stormont), and the Uganda Survey Department (Mr. H. B. Thomas), and the invited guests, Monsieur M. Binger (Patron's Medal 1899) and Dr. Knud Rasmussen (Founder's Medal 1923), were at the last moment unavoidably absent.

Cordial letters of congratulation and good wishes were received from a large number of Societies and Institutions which had been invited but were unable to send Delegates.

THE CENTENARY MEETING: October 21 at 8.30 p.m.

The PRESIDENT (Colonel Sir Charles Close) took the Chair at 8.30 o'clock and called upon the Secretary to read telegrams of congratulation which had been received from their Royal Highnesses the Duchess of Aosta and the Dukes of Apulia and Spoleto, Marshal Lyautey, General Gouraud, Colonel Kozlov, Dr. Knud Rasmussen, Mr. Stefansson, Hassanein Bey, Senhor Batalha Reis, Mr. Nicolas Semenov Tian-Shansky, the Yugoslav Military Geographical Institute, the Geographical Society of Beograd, the Czechoslovak Military Geographical Institute, the Geodetic Institute of Denmark, the Geographical Institute of the University of Oslo, the Norges Svalbard og Ishavsundersökelse, the South Swedish Geographical Society, the Sociedad Argentina de Estudios Geograficos, the Manchester Geographical Society, and the British Arctic Air Route Expedition at Angmagsalik.

The HONORARY SECRETARY read a letter from the Italian Ambassador conveying from H.R.H. the Duchess of Aosta the gift of three volumes of her travels.

The PRESIDENT then said: On behalf and in the name of the Fellows of the Royal Geographical Society I beg to tender the warmest welcome to all those delegates of Foreign and British Societies and Institutions who honour us by their presence here to-night. The Council of the Royal Geographical Society have decided to celebrate this occasion by raising all those who are Honorary Corresponding Members of our Society to the status of Honorary Members and to create other Honorary Members from among the Delegates present.

The President then presented Diplomas of Honorary Membership of the Society to the following Delegates or their representatives:

Professor Roberto Almagià
Professor Ch. Biermann
Professor Albert Perry Brigham
Professor Odón de Buen
Professor Dr. Eugen Cholnoky
Maître Maurice de Cock
The Hon. Francisco Leon de la Barra
Señor Agustin Edwards
Monsieur Guillaume Grandidier
Director-Geral Mimoso Guerra
Professor Dr. J. P. Kleiweg de Zwaan
Professor Dr. Norbert Krebs
Professor Jerzy Loth
Señor Carlos A. Mackehenie
Hofrat Prof. Dr. Eugen Oberhummer
Professor Dr. Vaclav Švambera
Professor Martin Vahl
Professor Axel Wallen

The Map Room

THE PRESIDENT (Colonel Sir Charles Close)

WE are now going to attempt to describe, briefly, the history of the Society's one hundred years. The portions allotted to the various speakers deal with a succession of events in the history of the Society of which some of us naturally only know by reading books, because there are very few of us over one hundred years old! But for the remainder we shall find, as the evening goes on, that those who will speak will describe what they actually know, or what they think they know, which is not always quite the same thing. I will begin my brief account of the foundation of the Society and I hope it will be followed by those who know more than I do: certainly amongst the latter I must reckon Dr. Mill, the historian of our Society.

We are here to-night, both Fellows and Guests of the Royal Geographical Society, to celebrate its foundation one hundred years ago. And it was thought that nothing could be more appropriate to the occasion than the recital of some account of the History of our Society by a few of our Fellows who either have special knowledge of certain incidents and events in this history, or who themselves took part in the events that they will describe. We shall try in the brief time available to draw some picture of the growth of the body that we represent, of its early struggles, of difficulties successfully overcome, of its position in the world at large and in the world of science, and of the work which it has carried out for mankind.

The seven Founders of our Society set down clearly what they considered should be the objects of a Geographical Society in a memorandum drawn up and approved at a Meeting of the Members of the Raleigh Travellers' Club, and several other Gentlemen, held at the Thatched House, in St. James's Street, on 24 May 1830. They put down these objects under six heads. To print for the use of Members interesting and useful facts and discoveries; to accumulate a Library and a Collection of Maps and Charts; to collect instruments likely to be valuable to the traveller, with which he could practise; to prepare instructions for travellers, and, under this heading there is added the expression of a hope that the Society might be able to help travellers financially; fifthly, to correspond with foreign geographers and intelligent British residents in the various remote settlements of the Empire; and finally, to communicate with kindred societies.

It may, I think, fairly be said, that though our views have expanded and our objects are broader, and we no longer confine ourselves to the promotion of travel and exploration, still we do carry out those six objects which presented themselves to the minds of our Founders, one hundred years ago.

The Meeting of May 24 then proceeded to nominate a Provisional Committee to propose resolutions to be submitted to a General Meeting; and, with regard to this committee, Colonel Colby, Director of the Ordnance Survey, writes four days later: " A new Geographical Society is started and I am one of the provisional committee for its management. It bids fair to do well. Lord Aberdeen and all the leading people in his department, Lord Melville and the principal Naval characters, and, indeed, most of the Ministers, are in it."

The Foundation Meeting took place at the Rooms of the Horticultural Society, Regent Street, on 16 July 1830. Its first Resolution reads as follows:

That the Society, having been honoured with the gracious patronage and permission of His Majesty, be called "The Royal Geographical Society of London." Afterwards the words "of London" were dropped.

The Chairman was Mr. Barrow, Secretary of the Admiralty, afterwards Sir John Barrow, of whom Markham says that "In this influential position he worked steadily and untiringly for the advancement of science, and especially for the spread of geographical knowledge. After the death of Sir Joseph Banks, it is to Mr. Barrow that all Government aid to geography is due, including the despatch of the Arctic Expeditions and of several exploring expeditions to Africa. In 1830 Mr. Barrow was certainly the warmest and most powerful friend to geographical science in this country."

We can picture the Meeting as well attended, for, already, 460 names had been enrolled on the list of Members. It must be added that the meeting was entirely composed of men, dressed, of course, in the clothes of the period, with high collars and cravats, trousers strapped down in the uncomfortable fashion of the thirties, with great waisted coats and rather elaborate waistcoats. But, whatever their outward appearance may have been—and indeed it must have been a very dignified-looking assembly—the company was a really distinguished one. There were there statesmen, travellers, men of science, well-known officers of the services, and, as Markham says, "leading men of every profession who either saw the importance of advancing geography, or were actively engaged in its pursuit." It is quite remarkable how many of the names on the first list of the Society are familiar to us still. Amongst statesmen there are the names of Peel, Aberdeen, Russell; and in the world of learning and letters, those of Arnold, "Master of Rugby School"; Francis Baily, whose tables geographers still use; Beaufort; Brisbane; Brunel; Buckland; Colby; Everest; Franklin; Hooker; Lubbock; Lyell; Murchison; Parry; Sedgwick; Whewell; and many another. The Society had a splendid "send off." Its original, and intentionally varied, composition is still a tradition with us. We still are proud to number amongst our Fellows statesmen and men of science, travellers and writers, soldiers and sailors, and all who take a lively interest in our subject. At the Foundation Meeting, the Chairman, Mr. John Barrow, remarked that the extent to which the useful labours of the Society could be carried would depend, in a very great degree, on the assistance which the Council "may receive from the many individuals eminent in the Arts, Sciences, and Literature, and from the distinguished Officers of the Army and Navy," whose names appear on the list of Members. That has always remained true; and after a century's experience we can say that one source of our strength is that we have no narrow, restricted view as to the qualification of a geographer, nor as to the content of our subject, which is no less wide than the study of the Earth itself, but particularly includes the study of the Earth as the home of man.

DR. HUGH ROBERT MILL (VICE-PRESIDENT)

THE President has described vividly the meeting of the Raleigh Club at which the Royal Geographical Society was launched. It is my privilege to say a few words about the events which led to that meeting and very briefly about the results which followed it in the first forty years of the life of our Society. The period is made up of ten years of happy progress in Regent Street, ten years of difficulty and depression in Waterloo Place, and twenty years of mature vigour and prosperity during which the Society moved to Whitehall Place.

At the beginning of the nineteenth century the pursuit of Geography in Great Britain was being carried on in the great tradition of Captain Cook. Sir Joseph Banks, the companion of Cook's first voyage, was promoting exploration through the African Association which he had founded in 1788, and like Linnaeus in the preceding generation he was sending out naturalists such as Robert Brown to Australia and others to other continents to study the fauna and flora of the least-known lands. Major James Rennell was the recognized master of surveys in India, of classical geography at home, and of the currents of the Eastern Atlantic. Mr. John Barrow was promoting Arctic exploration from his secretarial desk in the Admiralty. Mr. Francis Baily was elaborating the mathematics of Geography from the side of Astronomy. A group of inquiring young naval officers, including Parry, Franklin, Beaufort, and Smyth, were developing hydrographic surveys on all the coasts of the world step by step with Roy, Colby, and other pioneers of the Ordnance Survey at home, while Arrowsmith was making a reputation in the construction of maps.

On the Continent the spirit of Cook had been passed on through George Forster, his scientific companion on the second voyage, to the brilliant cosmopolitan savant Alexander von Humboldt, whose reputation and influence were at that time associated as much with Paris as with Berlin. D'Anville had cleared the map of the continents of the legendary lakes and mountains which were less ornamental and more misleading than the elephants and mythical monsters of earlier centuries. Vast blanks on all the maps bore only the fascinating inscription "Unexplored." The lure of the unknown was everywhere attracting the young and adventurous; travel was becoming a sport to many without ceasing to be the life-work of a few. There was however no coordination of effort, no focus of information. Every man did that which was right in his own eyes, and for a time such knowledge as had already been gained was hard for an intending traveller to consult.

Then in 1821 the geographers of Paris united to found the Société de Géographie, the fame of which was not slow in penetrating to other countries. In 1828 Humboldt and Carl Ritter secured the formation of the Gesellschaft für Erdkunde in Berlin, and a sense of the need of a similar organization in this country began to find expression.

In 1827 a young officer, Sir Arthur Broke, started the Raleigh Travellers' Club for the purpose of holding fortnightly dinners at which men should meet who had travelled in all parts of the world. It was a select body, limited to forty members so chosen as to blend the spirit of adventurous and of scientific travel. Barrow, Franklin, Parry, Beaufort, and Brown were members; but some solid

geographers, including W. H. Smyth, stood outside the Raleigh Club, viewing its easy-going convivial atmosphere as ill-suited for the inspiration of serious students.

The first call for a Geographical Society came neither from the Raleigh Club nor from its austerer critics. It was conveyed in a letter to the *Literary Gazette* in May 1828 written, it appears, by a boy of seventeen who wished to see in England a Society corresponding to the Société de Géographie in France. This would, he thought, become a meeting place for travellers and men of science. He dwelt on the pleasure which an evening meeting with tea and coffee would afford after some explorer's lecture, using words which might apply to any of those happy gatherings of this Society in the Burlington Gardens' days of twenty years ago, which we hope to see revived to-night in the ample spaces of our new Ambulatory.

The Editor of the *Literary Gazette*, Mr. William Jerdan, added a note warmly commending the proposal. A few months later a colleague of Charles Lamb in the India House wrote in cordial support of the scheme, but neither of these forerunners seems to have done more. Before the end of 1828 Mr. John Britton, famous as an antiquary who had tramped over every county of England to discover and record its beauties, went a step beyond words, and in association with Jerdan began to lay the foundations of a London Geographical Institution. Britton and Jerdan talked and wrote about their plan. They enlisted not a few supporters and they were always hoping to find some strong man to start the scheme. Neither of them had the driving power necessary to make it move, but they kept the idea alive in literary and educational circles.

Early in 1830 Mr. Britton and Captain W. H. Smyth came together and the strong man seemed to be found. The course of events now becomes obscure, for every one who has written of this period gives or suggests a different sequence of events. It is much to be hoped that some person with leisure and insight will be found to make a more thorough search amongst the records of the period than it has been possible for me to do. The result could not fail to be instructive.

Smyth, it appears, had already discussed the formation of a geographical society with the venerable Major Rennell, and it is probable that he had taken some steps before he met Britton. What is certain is that on 12 April 1830, Smyth, Britton, and a group of like-minded friends met at a party at Mr. Baily's where the prospectus of a Geographical Society was drafted, Britton being named as Secretary and the Rev. G. C. Renouard as "Foreign and Honorary Secretary." Separate versions of this prospectus seem to have been issued by Smyth and Britton, but here the narrative again becomes obscure; we know, however, that both men were busily canvassing for supporters and that they enlisted several members of the Raleigh Club.

In the Raleigh Club some of the supporters of Britton's scheme were viewed with mistrust as radical visionaries, and although the members felt that the time was ripe for action they desired a more acceptable leader. The one man who combined all the requisite qualities was Barrow. If he could be induced to lead, success was certain. He was appealed to, and after some persuasion consented to organize a Geographical Society. The result was the special meeting of the Raleigh Club on 24 May 1830 which the President has described.

Smyth associated himself with the new plan, but Britton was not apparently aware of what had happened for some weeks. He felt keenly that his own efforts had been ignored; but on finding that many of their best supporters had gone over to the opposition he and Jerdan magnanimously resolved to sacrifice their own ambitions and to give cordial support to Barrow's Society. Smyth and Britton became members of the first Council, while Renouard was given his projected post of "Foreign and Honorary Secretary." Jerdan was content to be an original Fellow.

Thus the three projects put forward by Captain Smyth, by the *Literary Gazette*, and by the Raleigh Club were happily united to form the structure of the Royal Geographical Society which was launched on 8 November 1830. The new King, William IV, was Patron; Viscount Goderich, an ex-Prime Minister, was President. The Treasurer was Mr. John Biddulph, great-grandfather of Lord Biddulph, our Treasurer of to-day. Amongst the Vice-Presidents were Mr. Barrow, Mr. Greenough, and Mr. W. R. Hamilton, great-grandfather of our President-Elect, Sir William Goodenough.

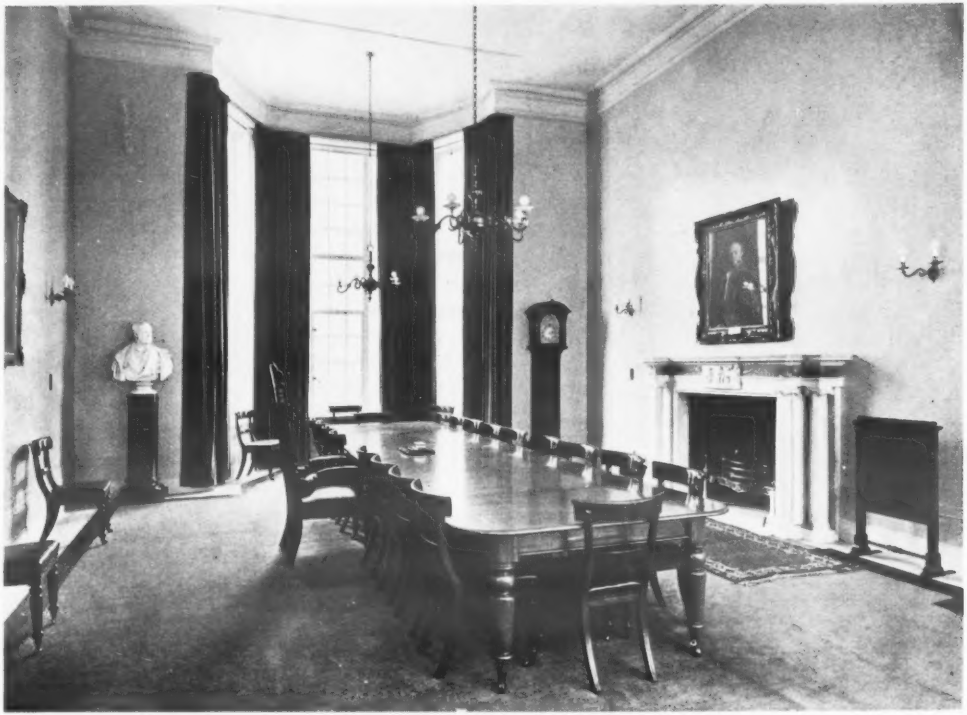
The Society made a happy start on its career. The African Association was merged in it at an early date and for ten years increasing prosperity was its lot. The initial membership of 450 grew to something over 700. Housed in the premises of the Royal Horticultural Society in Lower Regent Street, the Society was served successively by two able naval officers as Secretaries. At the first evening meeting Mr. Britton had the felicity of exhibiting and describing the famous mediaeval wheel-map of the world dating from the thirteenth century which Mr. Biddulph had induced the Dean and Chapter of Hereford Cathedral to lend for the occasion.

The Royal Premium of fifty guineas given annually by the King for the encouragement of geographical discovery was at first awarded in cash, Richard Lander for the Niger, John Biscoe for the Antarctic, and Sir John Ross for the Arctic, being the first recipients. Later, half of the amount was expended on a Royal Medal, the design for which aroused much controversy as to whether it should always bear the effigy of the King or should be struck from a fresh die on each occasion with a portrait of the recipient. The King preferred the former alternative, and since then the head of each succeeding Royal Patron has appeared on the Medal. Queen Victoria acceded before the first Patron's Medal had been issued, and a new medal was struck inscribed to her as Patron, while the first medal was continued in memory of William IV as Founder. The Founder's and the Patron's Medal, which are of equal value and of equal honour, have been awarded annually to explorers of every nationality for discoveries in all parts of the world. On the death of Queen Victoria her medal was kept in being to be awarded when occasion arose for geographical research. All the medals are now struck in the Royal Mint.

Exploration was the watchword of the first decade, and a portion of the savings carefully invested by Mr. Biddulph was used for the purpose. The young Society boldly, if rashly, undertook to finance and direct no less than three expeditions: Alexander's in South Africa, Schomburgk's in British Guiana, a brilliant success, and Ainsworth's to Kurdistan, which proved costly and troublesome.

The Presidents, each of whom served for two years, included Sir John

The southern section of the Ambulatory, looking east



The Council Room

Barrow, the wise old founder, Mr. Greenough, the earliest benefactor of the Library, and Mr. W. R. Hamilton, famous as a scholar and antiquary. Mr. Biddulph bewailed the absence of business men on the Council and with good reason.

When the second decade began in 1840 the Society for the first time occupied a home of its own, 3 Waterloo Place; but its financial condition had become unsatisfactory and rapidly grew worse. The presidents were men of standing and ability: Mr. W. R. Hamilton for a second term, Mr. R. I. Murchison, one of the keenest of the founders but still almost wholly absorbed in Geology, Admiral Lord Colchester, and Mr. W. J. Hamilton, son of the earlier president. The Secretary was Colonel Julian Jackson, an able physical geographer but less successful as a manager and organizer. The number of Fellows ceased to increase, a very large proportion had become life-members, paying a composition fee which was fixed far too low, and many of the annual subscribers habitually forgot to pay. The country was in a state of economic depression, unemployment and famine lasted throughout "the hungry forties." There was no income available to spend on expeditions, and investments had to be realized every year to meet current expenses. *Punch* poked fun at the meetings, and some other organs of the Press made unjust attacks on the Society and its Secretary. But throughout this painful time the annual *Journal* was kept up, though in a shrunken form, and the Royal Medals were conferred with discrimination and impartiality.

Counsels of despair emanated from the presidential chair; it was even proposed to carry on the Society's work until the invested funds were exhausted and then to bring the whole thing to an end.

At the darkest hour, when the ship of the Society, a metaphor much in favour at the time, was "bound in shallows and in misery," Captain W. H. Smyth, one of the earliest of the founders, was chosen as President. In his long sea service he had never lost a ship and he was not minded to let this one go hopelessly aground. His tempestuous optimism scattered all difficulties. He rejuvenated the Council by importing able business men like Mr. John Murray the publisher, and practical geographers like Arrowsmith. He took drastic steps to recover arrears and to enforce rigid economies. Smyth put new heart into every one, and at the end of his second year he left the Society fairly afloat on the ocean of prosperity, with a balance at the bank and a revived passion for exploration.

From this time onward the curve of prosperity of the Society has been rising, save for ten years of equilibrium in the eighties and for a temporary dip during the Great War. There were 1000 Fellows in 1856, 2000 by 1865, 4000 by 1900, and more than 6000 since 1924.

By 1850 the affairs of the Royal Geographical Society had come to occupy a large part of the time of Sir Roderick Murchison, and for the following twenty years he was supreme as the director of its destinies, for most of the time as President, but exercising scarcely less influence in the intervals when distinguished noblemen of good will but little leisure occupied the Chair.

In courteous terms he had informed the Prince Consort in 1852 that "a removal to Kensington Gore was not compatible with the well-being of the Society," so remote from the centre of London activity was this site then. He secured

instead Sir John Rennie's house in Whitehall Place for the headquarters of the Society in 1854, and with the loyal support as successive assistant secretaries of Norton Shaw and H. W. Bates he placed its activities there on a new footing as a national institution, aided by a substantial annual grant from Government.

Murchison obtained a Royal Charter of incorporation for the Society in 1859. He continued with unceasing enthusiasm to direct the ever-growing enterprises in exploration which resulted in the penetration of every part of Australia and in the settlement of the main features of the hydrography of Africa by Burton, Speke, Grant, Baker and, above all, by Livingstone, his dearest friend.

The honorary secretaries during the earlier years of Murchison's supremacy were content to carry on their duties as a quiet routine, but in the later years, while the old leader's strength declined, the reforming zeal of Francis Galton and the indefatigable persistence of Clements Markham made the good ship throb and quiver with the promise of a new motive power and an altered course to bear her on her voyage to the goal of a fully discovered and comprehended world.

I close my glimpse of the rise and early progress of the Society with the ship of our destinies proceeding full powered on a smooth sea under cloudless skies. Of its adventures in the later years when Whitehall Place and Bates led on to Savile Row and Keltie and later to Kensington Gore and Hinks, others who exercised a determining influence on its course will tell.

MR. DOUGLAS FRESHFIELD (PRESIDENT 1914–1917)

I UNDERSTAND that I am called on to-night because I am the oldest ex-President available; and it is believed that I may retain some impressions, or reminiscences, of the legendary mid-Victorian years (what one might almost call the prehistoric age of our Society). It is, I agree, probable that I am the only Fellow present to-night who was admitted by Sir Roderick Murchison. At that date, in 1870, sixty years ago, admission was something of a ceremony. At a General Meeting the new Fellow was marched up to the platform where he was shaken hands with and greeted by the President with his favourite formula: "In the name of and by the authority of the R.G.S. I hereby admit you a Fellow thereof." In my case there was a further ordeal. In those early days Sir Roderick himself was apt to read beforehand papers offered to the Society. I found myself in his impressive Library in Belgrave Square being cross-examined as to the Caucasus. "Your paper," Sir Roderick said, "is too long: in reading you can leave out the geography; print it afterwards: give us the adventure." I quote this not as a *lapsus linguae* but as a significant *obiter dictum*. It was an outcome of Sir Roderick's feeling that to make his beloved Society a success he must show geography to be, in the phrase of its founders, not only "a most important but an *entertaining* branch of knowledge" (I quote from their prospectus).

I may add here that I found an opportunity to follow the President's suggestion by "giving my geography afterwards" in the shape of a map of the Central Caucasus which provided the world with the first authentic picture of its

peaks, passes, and glaciers. An American traveller who has just returned from Russia tells me that this map has been reproduced by the Soviet Government at Moscow and distributed locally. This is an unexpected compliment to the work of our veteran Map Curator, Mr. Reeves, to whose skill and patience in working up my rough materials it owes most of its merits.

In 1881, the year in which Sir Roderick died, I became one of the Honorary Secretaries. The pathetic story of his last visit to 1 Savile Row is told in Dr. Mill's Centenary History of the Society, a series of condensed biographies written with knowledge and without prejudice, nowadays a rare distinction.

During his long Presidencies Murchison had been the figurehead of the Society and its presiding, if not its moving, spirit. During the next twenty years his successors in the Chair were mostly Peers and Proconsuls, but, except Sir Henry Rawlinson and Sir Richard Strachey, not geographical experts. For a period the Council ruled the Society with the assistance, and to a certain extent under the guidance, of the early Honorary Secretaries, amongst whom were William Spottiswoode, Francis Galton, and Clements Markham. From the permanent staff they could rely on constant expert advice and support. The silent but impressive sagacity of Bates, and the persuasive good sense of Keltie, each in turn proved most valuable influences.

The Council itself was efficient as an administrative body. But it was essentially conservative and averse to venturing on new branches of activity. It regarded as its distinctive function the provision of funds for exploration, the giving of advice to explorers, the recording of their results, and the celebration of their return by banquets and due honours; or, should they fall, of their fate by appropriate memorials. While anxious to maintain a high position as a scientific body, the Council was at the same time desirous to win and hold the popular favour on which it depended largely for funds. It was disposed, therefore, to concentrate itself on discovery and to employ its energies by taking advantage of the national passion for hero-worship, which in Victorian days had not been abused and vulgarized by the Press. The moment was fortunate for such a policy. The mysteries and perils of the Arctic have always made a strong appeal to the British public. Franklin's disappearance and the protracted search for his lost ships emphasized it, and added a romantic personal touch.

From the Arctic interest rapidly shifted to the Equator. In Africa the missionary career of Livingstone, the idea of bringing light to those in darkness, still more the prospect of scotching slavery at its root, touched the religious and philanthropic chords in the national mind and endeared the dour Scotchman to popular imagination.

As time rolled on, through the journeys and disputes of Speke and Grant, of Burton and Baker, and the strenuous adventures of Stanley, the great Nile lakes Victoria, Albert, and Edward emerged in turn out of their secular seclusion and took their proper places in our atlases. The snowy peaks of Ruwenzori, with their storm-lashed glaciers and fantastic forests, broke like a vision out of their veil of mists to prove once more that facts may be even stranger than the travellers' tales that have sprung from them.

If our Victorian Councils, thus occupied, did not abound in efforts to set up a high standard of scientific and human geography we must remember that

geography in the wider sense in which we have learnt to pursue it was in this country hardly yet in the air. Our Public Schools treated it as at best a test of memory. Our Universities did not find time to trouble their heads about so humble a branch of knowledge. There was no voice to remind Cambridge of the eloquent appeal made to it by Milton—to turn from its abstruse pursuits to the study of the world we live in. I cannot resist pausing to quote a few lines from Milton's *Third Prolusion*. The poet exclaims, "How much better and more worthy of you as Members of this University to study all the countries of the World, set out on the map, and to visit them in your imagination, next to observe the manners of men, and thence to investigate the nature of all living things."

It must not be inferred from anything I may have said that the Council was indifferent to the scientific side of the pursuit of geography. Sir John Keltie, in his excellent sketch of his thirty years' connection with the Society (*G.J.* 49, 1917, pp. 350–376), puts the facts with his usual fairness. The Council at the instigation of Sir Richard Strachey and Mr. Galton took some action in 1869: they promised medals to schoolboys, and in 1887 and the two subsequent years they arranged a series of advanced lectures by scientists of the highest distinction which continued for three years. But the medals tended to become a monopoly of a single school, and thus failed in their object; and the lectures ceased to draw audiences. The seeds were planted, but somehow the soil had not been adequately prepared, and there was possibly a lack of purposeful energy in the cultivators.

To us who are looking back, to render the Fellowship of the Society more attractive by issuing to Fellows a monthly periodical may seem an obvious step; to encourage geographical studies in the Universities, in the hope that they might filter down into our schools, may strike us as a reasonable, and indeed in the national interest an irresistible, proposal. But about 1880 a section of our Fellows looked with suspicion on any steps that might bring the Society into rivalry with commercial magazines. It was still more afraid of lowering its scientific reputation by taking any part in school teaching. It grudged to admit students certain admirals loved to designate "Schoolmaams" to such modest honour as may be conferred by the letters "F.R.G.S."

To some of the younger and more active-minded members of Council these objections carried little weight. The Honorary Secretaries at this period were both resident in London and able to devote much of their energy to the Society's affairs. They took a bold initiative in urging extensions of the Society's activities. Clements Markham, who had become an Honorary Secretary as early as 1864 had, when I joined him in 1881, just succeeded in inducing the Council to make a long-contested practical step. His proposal in 1879 was that the Society should issue and send to all Fellows a monthly magazine that might become in time a worthy rival to *Petermann's Mitteilungen*. Many were the obstacles and difficulties that occurred and the restrictions that were suggested in the minds of some of our veterans. Any such publication must—they argued—be called the *Proceedings* of the R.G.S. so as to distinguish it from the crowd of commercial and literary magazines on the book market. It would, they argued, entail a strain on our finances. Any reviews must not be critical; they must be limited to impartial notices of important works.

Any advertisements must be confined to articles used in travel and carefully censored. Illustrations were still in the future. But the insidious introduction of slides at lectures, followed by the purchase of a dioptric lantern in 1890, soon rendered them more or less irresistible.

The struggle was a protracted one: a series of skirmishes; the result a draw. For dignity's sake the new publication started in 1879 had to be called *Proceedings*, but the Editor might be allowed considerable powers. Bates was thus given at last a field to show his literary talents and his tact, and he tranquilly availed himself of it. He was happily succeeded by Keltie, both ideal editors. I need say no more. It was in 1893 that the *Journal* in its present form and title began a smooth career which of late years, thanks to Mr. Hinks, has been one of uninterrupted success.

The discovery and adoption of an educational scheme that might satisfy Mr. Galton's curiously critical mind—and succeed his own—provoked a more severe struggle. A reconnaissance in force in 1883 showed that the ground was not yet ripe. The Council was accordingly persuaded to send Dr. Keltie round the Continent to collect information as to the position of geography in foreign schools and Universities. After a year's travel Keltie came home armed with an admirable report which achieved its object. The Council felt that it must be followed by some action. So it resolved that the President should address the older Universities and promise the Society's support, both practical and financial, for creating Schools for geographical studies. A deputation from the Society went down to Oxford. Jowett was Vice-Chancellor at the time, and I remember well having to face his cross-examination. But it was a friendly one. A lecturer in geography was at once appointed. Before the end of the century geography had been firmly established both at Oxford and Cambridge. At Gower Street and in many provincial Universities schools were constituted in our branch of knowledge, and degrees, or diplomas, conferred. Their recipients found occupation as qualified teachers and wrote the excellent text-books which are displacing the inadequate ones previously in use.

England no longer loiters behind the rest of Europe in geographical studies, and this, we may fairly claim, is largely due to the action of our Society.

But I have come to the end of my time. In this hurried survey what I am most conscious of are my omissions. They are too many even to catalogue. But you can readily supply them from Dr. Mill's Centenary History, which I trust you will admit fulfils Sir Roderick Murchison's requirement of being entertaining as well as instructive.

LIEUT.-COL. SIR FRANCIS YOUNGHUSBAND (PRESIDENT 1919–1922)

I AM a mere child of the Society in comparison with Mr. Freshfield. Still I have been a Fellow for nearly half the period of its existence, and perhaps some of my early impressions may interest you. They were of gratitude, but they were tinged with awe. As a young subaltern of a regiment serving in India I had made a journey from Peking across Mongolia and Turkistan and over the Himalaya to India, and I had sent in a report about it to the Intelligence

Department; and there I had supposed the matter would rest. But Sir Henry Rawlinson and Sir Dighton Probyn had interested themselves in the matter and had cabled out to Sir Frederick Roberts that I ought to come home to lecture to this Society. So in May 1888 I came to England full of gratitude to the Royal Geographical Society. But full of awe, too. I was only twenty-four. Who was I to lecture before so learned a Society? And what had I done? I had covered a lot of ground certainly—and a good deal of it new. But what sort of a map had I brought back? One of immense length, for the journey covered about 3600 miles, but it was only a rough compass sketch. I had discovered a new range of mountains. What was the height of them? I could not say except that some of the peaks must be well over 20,000 feet. I had explored a new pass across the Himalaya. What was its height? I could not say, for my aneroid had gone wrong.

So, as I brazenly stood up before this Society forty-two years ago, I was filled with a sense of guilty inadequacy. I knew what importance they attached to map making. And there before me was an ex-Surveyor-General of India, one of the Council, who I felt sure would frown upon me for my neglect of duty as an explorer. At the same time I was bursting to tell this Society something of the beauty of the desert nights and evenings and of the glories of the Himalaya. I had been in close personal contact with, next to Everest, the greatest mountains in the world. I was profoundly impressed by their grandeur. And I could not resist telling some little of what I felt. But as I nervously read out my description I feared the displeasure of the President. Surely he would tap the table to remind me that I was addressing a scientific body and not a Poetry Society or the Royal Academy!

In the event, all deficiencies and delinquencies were overlooked. I discovered that the Royal Geographical Society was after all composed of human beings. They even enjoyed a spice of adventure. And when, two years later, they were good enough to recommend me to Her Majesty for a Royal Medal —and I am, I believe, the youngest to whom it has ever been awarded—my feelings of gratitude were many-fold increased, while the awe was transmuted into reverence.

These were my earliest impressions of the Society. And perhaps here is the best opportunity of saying how greatly, in those early days, I valued the 'Hints to Travellers' published by this Society. The copy I had with me on my journeys of 1886, 1887, and 1889 is now in the Society's Museum, and often have I studied it on my journeys.

My next impression of the Society was formed a few years later, when either I would be lecturing on my journeys in the Shaksgam Valley, on the Pamirs, and in Hunza and Chitral, or the Hon. George Curzon would be lecturing on his journey to the Pamirs. In either case George Curzon, as he then was, Lord Curzon as he afterwards became, aroused unusual interest in the proceedings by the fervour of his speeches. Those were the days when the Russians were steadily advancing towards the Indian frontier from Turkistan. People wanted to hear about the mountain borderlands of Northern India. Curzon was then just beginning to make his mark in politics. By travelling through Persia, Russian Turkistan, and on the Indian frontier he had made himself thoroughly versed in the whole position as between us and the Russians. And when he

spoke before this Society he would capture his audience by his own ardent enthusiasm.

Curzon had many ambitions, and not the least of them was to be an explorer. In those days few knew of the spine trouble from which he suffered all his life. And I now marvel at his pluck in travelling as much as he did. He came round Chitral with me in 1894 on his return from the Pamirs, and not knowing of his infirmity I took him pretty long marches. I cannot say he did them without a murmur. But he did them. And he worked hard at private correspondence and at the series of letters to the *Times* both before we started and after we came in. His pluck and his industry were remarkable. And for our Society he had always a great affection. He would throw his whole energies into our service whenever the call was made. And what he did for us during his Presidency is told in full detail in Dr. Mill's 'Record of the Royal Geographical Society.' I will only refer to one episode of that time.

Lord Curzon, with a view to raising the literary standard of the papers read before our Society, had persuaded Mr. Rudyard Kipling to address us on "Some Aspects of Travel." He described with great eloquence and with the aid of a blackboard what was in the mind of a traveller. As I listened I thought with shame how empty my own mind was in comparison with what it ought to be. At the end I said to another traveller, "I suppose your mind is like that?" He replied "No; but I take it yours is?" I said "No, mine isn't either." Then the thought struck me: Perhaps we both had these astonishing minds, only it took a genius like Kipling to see it!

Lord Curzon was succeeded by Mr. Freshfield. The new President had been far longer and more intimately associated with the Society than his predecessor. And it was a misfortune for the Society that the term of his Presidency fell during the War years. For with his culture, his wide travel, and his intimate knowledge of the needs and wishes, the feelings and traditions of the Society he might have made a most beneficial mark on it as it started its new life in these more ample buildings. Even as it was he managed during all those dreary years to put a charm into our proceedings which made them a delight.

When in due course I had the honour to be elected our thirty-fifth President I determined to make use of the opportunity and stimulate the spirit of adventure. As a young man I had received most welcome encouragement from our Society, and I would make use of my Presidency to do for others what had been done for myself. And an enterprise just suited for the purpose was ready to hand. It was one which Freshfield had long had in view and which he would have loved to have put through if his own Presidency had not fallen in War years. This was the ascent of Mount Everest. There were those on the Council who looked upon an expedition whose unabashed object was to climb the highest mountain in the world as something verging on the sensational, and therefore unsuitable for a scientific Society like ours. But I had heard the same thing said about Scott's expedition to the South Pole. And I entirely disagreed with it. I held that there was not a square foot of the planet's surface to which Fellows of this Society should not at least try to go. That is our business. That is what we are out for. And if we aimed at the highest point on the Earth, even if we did not reach it, we would spur men on to climb all lesser heights. In the Himalaya there is a vast region between the altitudes of 20,000 feet and 29,000

feet above sea-level awaiting exploration, and it includes seventy-five peaks of 25,000 feet and over, not one of which has been climbed. The climbing of Mount Everest would stimulate efforts to explore that region, and it would give us increased knowledge of man's capacity to climb in the higher regions of this Earth. And if such work was not considered "scientific"—well, the meaning of the word "scientific" must be expanded till it did. Anyhow it was increasing knowledge of the Earth's surface, and that is geographical knowledge. And it is to promote such knowledge that this Society exists.

Sometimes exploration is much better conducted by single individuals or quite small parties. A single individual may penetrate when even only two might be stopped—either through lack of sufficient supplies and transport or else because the inhabitants view two men with more suspicion than they do one. But for such enterprises as climbing Mount Everest, or reaching the Pole, expeditions on a big scale are necessary. And it is here that our Society can show its usefulness. It can either initiate and organize an expedition, as it did in the case of Scott's first Polar expedition and of the Everest expeditions; or it can aid private initiative by financial and moral support, as it did in Scott's second expedition and many other cases. Also it can associate other societies with it. And it was through association with the Alpine Club that the Mount Everest Expedition was conducted. Incidentally, I may observe that that association still continues. The Mount Everest Committee is still in being. Funds are in hand. And we only await what Mr. Gandhi would call a "change of heart" in the Tibetan authorities to continue our efforts.

One other object I had in view during my Presidency. I have told you how in delivering my first lecture to this Society I was pining to express the impression the sight of the highest Himalayan peaks had made upon me but had feared that any such aberration from the narrow path would be considered "unscientific" and therefore unworthy of the Royal Geographical Society. But now that I was President I felt free to have my own say in this matter. In my Presidential Address I therefore claimed that the description of the natural beauty of a region was just as much our business as the measurement of it for a map. To know all we can about the face of Mother Earth is our business. And if we can see beauty in her features we should say so and say wherein that beauty lies. Travellers should be measurers certainly. But if they also have something of the artist in them they should not suppress it when addressing this Society. Rather should they train and develop that side of them as carefully as Mr. Reeves trains them in measuring, so that they can bring back from a region not only a map but a picture as well—a picture either in words or in colours, but anyhow enabling us to see the particular beauty which is its—and even a desert has it own peculiar beauty. Then only shall we be able to know and understand a country to the full.

These two things, therefore, the spirit of adventure and interest in natural beauty, I sought to stimulate during my Presidency.

But every President knows that while he appears on the front of the stage and receives all the plaudits the real work is done by one who keeps himself discreetly in the background—or as much in the background as his dimensions will allow—and that man is styled the Secretary. The Secretary during my Presidency was the present Secretary, Mr. Hinks. He has always striven to

keep up the high standard of the Society and that distinction which has been given to it in the old days by Barrow and Murchison, and in later days by Markham, Freshfield, and Curzon. And the Society is greatly indebted to him.

THE MARQUESS OF ZETLAND (PRESIDENT 1922–1925)

THE happy circumstance that we are able to celebrate the centenary of our Society within the walls of the admirably designed lecture hall in which we find ourselves is due in large measure to the devoted labours of our President, Sir Charles Close, and our Secretary, Mr. Arthur Hinks. For the superstructure we are indebted—and, indeed, greatly indebted—to them. Yet we have to remember that without a foundation no superstructure would have been possible, and for the foundation of our present habitation we have to thank the volcanic energy and the mendicant ability of an earlier President, the late Lord Curzon. Within four days of his assumption of the Presidentship in May 1911, Lord Curzon had announced at the annual dinner of the Society his intention to acquire for it an abode more worthy than the building in Savile Row of its pre-eminent position and better suited to the rapidly expanding scope of its activities. The idea was not a new one. A building fund had, as a matter of fact, been inaugurated two years earlier by Major Leonard Darwin. But this fund, aided though it had been by legacies amounting to £3000, had only reached a total of £6400 when Lord Curzon took up the task. Within eight months of his assumption of office he had added to the existing fund by his own exertions no less a sum than £31,000, and had secured from the Government a promise of an increase in their subvention from £500, at which it then stood, to £1250 a year. At a meeting of the Society held on 15 January 1912 he obtained the authority which he sought to sell the premises in Savile Row, and by the end of July had not only disposed of the building for a sum appreciably above the reserve placed upon it, but had effected the purchase of Lowther Lodge, with the result that in April 1913, within two years of his assumption of the office of President, he had the satisfaction of seeing the Society installed in its new home. Not the least of the merits of Lowther Lodge in Lord Curzon's opinion was the possession of an area of surplus land, part of which, as he pointed out in a letter to the Fellows in July 1912, might be sold and the proceeds used for the erection of a lecture hall. "We should thus be in a position to secure our own hall for nothing," he explained, "and to solve the problem which has baffled us for half a century." But for the intervention of the European War it is probable that this forecast would long before now have seen fulfilment. The hall has indeed been secured, though not by any means for nothing. Yet thanks to the success with which others have played the part of Elisha to the Elijah of Lord Curzon, the sum required to add to the amenities of the Society's home not only the lecture hall, but the adjoining ambulatory, Council room, Secretary's room, book store and library, is almost in sight. It is, perhaps, worth while recalling the fact that it was to Lord Curzon, himself an uncompromising opponent of the *political* enfranchisement of women, that our lady Fellows owe their eligibility for admission to the Fellowship of the Society. And in these days when one of the first solo flights

from these islands to Australia stands to the credit of a woman, there will be few, I imagine, who will dispute the justice of the step taken in 1913 on his initiative.

From these reminiscences let me turn for a moment to exploration. The award this year of the Patron's gold medal to Carsten Egeberg Borchgrevink, in somewhat tardy recognition of the part which he played in the exploration of the Antarctic thirty years ago, recalls the success of our Society in face of much lethargy and even opposition on the part of various Government Departments, in promoting the exploration of those regions. It was under the auspices of the Society, and largely as a result of the untiring zeal of the then President, Sir Clements Markham, that the steamship *Discovery* with Scott in command and with Armitage, Royds, Barne, Skelton, Wilson, Koeltlitz, Hodgson, and Shackleton on board, together with a small staff of scientists, set forth in August 1901 upon its adventurous and fruitful voyage. It was under the same auspices and as a result of the same forceful guidance that the barque *Morning* was equipped and despatched, at a cost of £50,000 raised by the Society, in July 1902 under the command of Captain Colbeck to seek news of the *Discovery* in her winter quarters. The whole story of the expedition is told with admirable lucidity by Dr. Mill in the volume in which has been set forth the history of the first one hundred years of the Society; and I have merely recalled the story of the expedition as an example of the leading part which the Society played in what was described in a resolution passed at a meeting of the International Geographical Congress at which Borchgrevink gave an account of his visit to the Ross Sea in 1894–95, as "the greatest piece of geographical exploration still to be undertaken." Scott's exploits are commemorated by a statue which stands in Waterloo Place; a bronze bust of Clements Markham, the gift of the Government of Peru, stands near the entrance of the Society's house, and many will be glad to know that a full-length statue of Shackleton, whose voyage in the *Discovery* proved to be but the prelude to much further achievement in Polar exploration, will shortly fill a niche on the exterior wall of the new building in which we are now assembled.

I would not have it supposed by the reference which I have made to the outstanding achievements of Scott and Shackleton that the Society is indifferent to the success of the explorers of other nations, whether in the Antarctic or in other regions of the Earth. On the contrary, it is our boast that our outlook is a comprehensive one and that we welcome the cooperation of, and provide a platform for, the geographers of all nations. Einstein has said of the Universe that it is finite but without boundaries. As geographers we may well say the same of the planet on which we live, both in the sense that we recognize no boundaries capable of arresting the advance of our explorers and in the sense that where our science is concerned we treat the political and linguistic boundaries which separate one nation from another as non-existent. You have only to cast your eye over the long list of the Society's gold medallists to realize the extent to which we have recognized the achievements of the geographers of other lands. One of the first expeditions launched under the auspices of the Society was that of a young German naturalist into the interior of British Guiana in 1833. From first to last the Society contributed not far short of £1000 to Mr., afterwards Sir Richard, Schomburgk's journeys, which

resulted among other things in the discovery of the water-lily named Victoria Regia; and in 1840 it awarded to him its gold medal. During recent years such recognition has been bestowed upon geographers of other nations with increasing frequency; for work in the arctic regions upon Stefansson, Leffingwell, Knud Rasmussen and Lauge Koch; for exploration in Northern Africa upon Ahmed Hassanein Bey; for geodetic surveys in Ecuador and in France upon General Bourgeois; for his development of the theory of isostasy upon Mr. J. F. Hayford and for his life's work in the study of the origin and characteristics of the forms of land upon Monsieur Emmanuel de Margerie. And if you make a careful study of the records of the Society from the time when King William decided that foreigners should be eligible for the Patron's Medal onwards, you will find in them the names of a host of distinguished foreigners. There are probably many here to-night who remember the enthusiasm of the crowded audience which listened during the opening weeks of Mr. Freshfield's Presidentship to Theodore Roosevelt's story of his Brazilian journey; others will recall the awards made to Commandant Tilho for his exploration round Lake Chad, and again to Professor Albrecht Penck, who, as Dr. Mill reminds us, "stood smiling and smiled upon to hear the praise on our part and express the gratitude on his own, in May of the fateful year 1914." A few possibly there may be who will recall the single occasion on which the Patron's and the Founder's Medals were awarded to the leaders of the same expedition, namely, to the Austrian naval officers, Payer and Weyprecht in 1875 for their discovery of Franz Josef Land. It would, indeed, be easy to speak at great length of the many distinguished foreigners who have had close relations with our Society, but time forbids, and Nordenskiöld, Amundsen, Peary, and Nansen; Garnier, Vambery, Von Richthofen, and Sven Hedin; Elisée Reclus, Abruzzi, and Filippo De Filippi are names taken at random which must serve merely as illustrations of my theme. Moreover it would be ungracious of me if, before I resumed my seat, I were not to point out that if the Royal Geographical Society has not been backward in extending its help, and according its recognition, to the geographers of other nations, they in their turn have not infrequently laid the Society under a debt of gratitude to them. It was an American naval officer, Captain Hanstene, who brought over to England as a gift from the United States, H.M.S. *Resolute*, picked up a derelict by an American whaler, after having been abandoned in the course of an unsuccessful search for Franklin. To another American explorer and Medallist, Dr. Hamilton Rice, and to his wife, we are indebted for a princely contribution towards the cost of the Hall in which we find ourselves to-night; in much earlier years, when the Society was passing through times of great difficulty, it owed much to its Assistant Secretary, H. Norton Shaw, the son of a general in the Danish Army born in the Danish West Indies; and to turn once more to recent years—those of my own Presidentship—we are beholden to Mr. A. P. H. Hotz, a gentleman of Dutch nationality, for the gift of a wonderful collection of books which has proved an asset of great value to our library. By a steady continuance of the cultivation of such relations with the geographers of all nations will the Society further the best interests of the science which it upholds and play its part in strengthening the bonds which unite within the common fold of humanity peoples of all races and of all creeds.

The PRESIDENT: Now we hope to hear a few of the foreign delegates, and I first call upon the Hon. Francisco Leon de la Barra.

Hon. FRANCISCO LEON DE LA BARRA (Delegate of the Mexican Society of Geography and Statistics, past-President of the Republic of Mexico): It is a great honour for me to offer, on behalf of the Mexican Society of Geography and Statistics, most sincere congratulations to the Royal Geographical Society on the memorable occasion of the centenary of this illustrious British institution and to express a deep wish for its everlasting prosperity.

The Centenary we are celebrating is of great importance for the scientific and practical activities in the life of the glorious British nation. It is also important to those who have been able to estimate the value of the work accomplished by the Royal Geographical Society during the fruitful century of its existence. The Society has encouraged and in many instances directed scientific exploration of the whole extent of our planet, from tropical regions to the Arctic zone; it has proceeded by the experience of voyagers to classify facts and to find the solution to phenomena which offer themselves for research in that vast realm covered by the Society. By its efforts the Royal Geographical Society has contributed to the creation of Modern Geography; that is, to the work accomplished by English scientists and those of other nations; for geography is a branch of knowledge which not only deals with the description of our Earth but also is many-sided. We are asked to define and amplify the whole conception of Strabo, that man's activity depends on geographical conditions and the changes which he has been able to carry out in those conditions, cutting through continents, opening new routes for commerce and freeing the imprisoned forces of the waterways and those mysterious elements in the atmosphere surrounding us, in order to become their master.

The Mexican Geographical Society, which I have the honour to represent, knowing the importance of the work accomplished by the Royal Geographical Society in this domain, joins with all its heart in the homage which the scientists of the whole universe are offering to the Society to-day. Our Society, founded in 1839, has always kept in view the great British institution which stands as an example, and it has tried modestly but with effective perseverance, as witnessed by the publication of its *Bulletin* during more than ninety years, to collaborate in the progress of geographical science.

In order to enable you to understand the warmth and sincerity of our wishes for the prosperity of the Royal Geographical Society, allow me to remind you on this occasion of three of the factors which have created and upheld sentiments of gratitude towards England. The generous action of the University of Cambridge in 1788 in favour of the abolition of slavery could not be ignored in Mexico. Then at the time of our emancipation from Spain, England was the first country to recognize the new Republic, which has not forgotten and will never forget this action. England's name is inscribed in the first page of our book of history immediately after the Act of Independence. And thirdly this great country gave us in its Magna Carta one of the most profound lessons that the world has ever received.

Those are the factors which strengthen the sincerity of our wishes for the still more brilliant and useful future of the Royal Geographical Society, one of the greatest and noblest institutions of England.

Général Bourgeois (Membre de l'Institut): Mesdames, Messieurs,—Je ne saurais vous dire, aussi bien comme géographe français, que comme Président de l'Union Géographique Internationale, combien je suis heureux de me trouver aujourd'hui, à l'occasion de ces splendides fêtes du Centenaire de la Royal Geographical Society, au milieu de tout ce que le monde entier compte comme éminents géographes.

Je sais, nous savons tous, ce que la Royal Geographical Society a fait dans le domaine de la Science qui nous est si chère. Des voix plus autorisées que la mienne vous ont retracé l'histoire de son œuvre si vaste et si féconde. Il n'est pas un coin du monde où ne se trouve la trace de ses explorateurs, de ses savants, de tous ces pionniers de la science qui, par leurs efforts inlassables, ont contribué soit à la découverte de régions inconnues, soit à la connaissance plus approfondie de la Terre. Aussi je m'honore grandement du titre de Membre honoraire de votre Société que vous avez bien voulu me décerner.

Je ne sais, Mesdames et Messieurs, s'il est une science plus prenante, je dirai même plus belle que la Géographie. Car que peut-il y avoir de plus attachant que de connaître et d'étudier les conditions physiques de notre globe—géographie générale et physique,—d'étudier ses productions et ses ressources—géographie économique—de chercher à savoir comment depuis les temps reculés jusqu'aujourd'hui a évolué l'humanité, se sont créées, se sont pénétrées, se sont modifiées les diverses races—géographie humaine,—et je passe bien d'autres côtés de notre Science. Je suis certain que prise dans son sens élevé, la Géographie est la science qui peut faire le plus, pour le rapprochement de tous les peuples et le bien de l'humanité.

C'est l'idée fondamentale qui a présidé à la création de l'Union Géographique Internationale, union qui doit réunir tous les géographes du monde, dans une même pensée de progrès à faire réaliser encore dans une science qui pour nous est l'objet de nos préoccupations dominantes, et c'est le vœu qu'en terminant je forme du fond du cœur, certain que je suis que c'est aussi votre vœu à tous.

Hofrat Professor Oberhummer (Delegate of the Geographical Society of Vienna): First I have to utter an expression of gratitude towards the Council of the Royal Geographical Society for the great honour conferred upon me in making me an Honorary Member of this illustrious Society. I do not consider that merely an acknowledgment of the modest merits, if any, which I may have in geographical research, but as an honour bestowed upon my country and on the geographical society of Vienna, over which I have for long years been privileged to preside. If you allow me a few words more, let me recall my first visit to London on the occasion of the Sixth International Geographical Congress in the year 1895, which, by the way, was not the first Geographical Congress which I attended. That was in Venice in the year 1881. You will observe that I have followed the science of geography over a somewhat lengthy period. The Congress in London, which was chiefly sponsored by the Royal Geographical Society, made a deep impression on the memory of those who attended it. I remember quite well that his present Majesty, King George, then Duke of York, most graciously welcomed the foreign delegates, among whom I

was the young delegate of the geographical society of Munich. I remember the glorious presidency of Sir Clements Markham whom I met for the last time at an International Congress in Vienna in 1898, and I was deeply touched when I saw to-day in the Society's house Sir Clements' portrait under which is a description of this great explorer and President. It was a great pleasure to the foreign members of that Congress to see and hear one of the greatest heroes of African exploration, Sir Henry Stanley, or to listen to the impressive speeches of Sir John Murray, or Sir Joseph Hooker, who had been a member of the expedition led by Captain James Ross to the Antarctic more than half a century earlier. I am glad, although many years have passed since that Congress, to meet in this illustrious Society some of the friends who took part in that gathering in London. I name my friend, Mr. Borchgrevink, who at the time of the Congress spoke of his Antarctic expedition. Borchgrevink was the first man to set his feet on the Antarctic continent more than fifty years after the great expedition of Sir James Clark Ross. I mention also Dr. Mill, who was at the time of the Congress Librarian of the Royal Geographical Society and one of the Secretaries of the Congress, to whom we are indebted for so many important geographical works, to say nothing of his comprehensive history of the Royal Geographical Society.

It is indeed impossible for me now to detail the merits of the Royal Geographical Society in connection with the promotion of geographical knowledge, merits which are admired the world over, as has been emphasized to-day by the attendance of delegates from all continents of the world. It remains to me, on behalf of the Geographical Society of Vienna, to join in the numerous congratulations and felicitations. It is our sincere wish that the first Centenary of the Royal Geographical Society may be followed by another hundred years of success and of glory.

Cav. FILIPPO DE FILIPPI (Delegate of the Royal Italian Geographical Society): Only a few hours ago I was informed that owing to the unavoidable absence of General Vachelli, President of the Italian Geographical Society, I would have the honour and the privilege of addressing this meeting which is literally an assembly of the most representative members of the geographical world. In offering the congratulations and good wishes of the Royal Italian Geographical Society, which in forty years will celebrate its centenary, I know I express the thoughts of all my countrymen who are in any way interested in geography. But there is a more personal message I should like to deliver connected with what Lord Zetland has so admirably expressed: a message of gratitude and a warm sense of obligation on the part of all those non-English geographers and explorers who have benefited by the encouragement, help, and generous recognition of the Royal Geographical Society in their endeavours to advance the knowledge of the Earth. I am certain that the many geographers of every country who have been the recipients of the Society's bounty share with me a deep sense of filial devotion and gratitude to this magnificent institution, always ready to help every effort, every initiative, and to recognize and honour every achievement. It is with these feelings that I rejoice in the universal tributes of admiration that the Royal Geographical Society is receiving in these days.

Professor ODÓN DE BUEN (Delegate of the Spanish Institute of Oceanography and Royal Geographical Society): Agradezco mucho el honor de haberme invitado a dirigiros la palabra y aún más la sugestión de que os hable en español; por desgracia no puedo expresarme en inglés.

Creo sin embargo, que ha de ser grata la lengua de mi Raza a la Royal Geographical Society; es el viejo idioma de los audaces y expertos navegantes que dieron por primera vez la vuelta al Mundo y surcando el Atlántico y el Pacífico, señalaron rutas nuevas para el Comercio y para el espíritu humano; es la lengua de heróicos exploradores que descubrieron y colonizaron tantas tierras y dieron a conocer seres vivos tan variados y fenómenos naturales tan complejos; es lengua geográfica pues son innumerables las palabras españolas que se emplean en la descripción de nuestro Planeta.

Es bien sabido que los pueblos peninsulares, españoles y portugueses emplearon inmensas energías en empresas geográficas que parecen homéricas.

Pues bien, en esa lengua española y en nombre del Instituto Español de Oceanografía y de la Real Sociedad Geográfica de Madrid, yo tributo el más entusiastico homenaje a la Royal Geographical Society en su primer Centenario de vida gloriosa y fructífera, haciendo los más fervorosos votos por que ese siglo sea tan solo el prólogo de una vida muchas veces secular, en beneficio de la Humanidad entera y para gloria de la Gran Bretaña.

Los héroes vuestros, los de las grandes exploraciones en el Africa y en Asia, los que perdieron su vida en trágicas ascensiones al Himalaya y en los intentos de llegar a los Polos, son figuras eminentes que honran a vuestra Patria pero son héroes en cualquier país que hayan nacido, son beneméritos de la Humanidad, sus proezas y sus sacrificios benefician a la Humanidad entera.

Como Oceanógrafo no olvido vuestra intervención en el estudio de los Oceanos, en la fundación y amplísimo desarrollo de esa Ciencia del Mar que tiene tan brillante porvenir.

No olvido tampoco que me escuchan eminentes personalidades a las que debemos gratitud los geógrafos españoles. Sir Charles Close, nuestro ilustre Presidente, que nos honró yendo a España cuando la Real Sociedad Geográfica de Madrid celebró su jubileo, dejando entre nosotros vivas simpatías. Junto a mí veo al respetable Sir Maurice de Bunsen, conocedor de nuestro idioma y de nuestras costumbres, gran amigo de eminentes personalidades españolas; y al lado, nuestro querido Secretario Mr. Hinks que estuvo el año último en Sevilla, en el Congreso internacional de Oceanografía, Hidrografía Marina e Hidrología Continental, celebrado con motivo de la brillante Exposición Ibero-Americana.

Aprovecho tambien la ocasión para manifestar el agradecimiento de la delegación española en el Congreso Internacional de Geografía de Cambridge por las atenciones de que fuimos objeto.

A los Colegas de todos los ámbitos del Mundo, aquí congregados, mi fervoroso saludo y muy especial y muy cariñoso a los que representan aquí, en el homenaje a la Royal Geographical Society, las Repúblicas de lengua española y portuguesa.

Dr. LAUGE KOCH: As one of the Gold Medallists I wish to tender my sincere thanks for the honour conferred upon me to-night. I think we can say that

geographers all over the world wish to be present at at least one meeting of this world-famous Society and we are glad, with so many others, to have been present on this historic occasion. Many of us have on several occasions been guests of the Society and of other institutions in England, and when we are in little-known countries we long to return to London and to meet old friends and members of this Society. When six years ago the Secretary told me of the new building that was to be erected, I wondered whether we should feel as much at home in it as in the old building. We have been in the new building to-day and we have realized that wonderful feeling of being at home which the Royal Geographical Society gives to the geographer in London. I think one of the secrets of the growth of this Society is that home feeling. Therefore I wish to thank the Society for everything they have done for so many of us, especially for giving us that feeling of being at home which always makes members abroad long to get back again.

At the conclusion of the Meeting tea and coffee were served in the Ambulatory and Map Room.

THE HABITABLE GLOBE

ON the morning of Wednesday October 22 the Delegates and Fellows met in the Hall of the Society at 10.30 a.m. to hear a series of communications on the Habitable Globe by invited geographers, British and Foreign.

Before calling upon the reader of the first communication, the PRESIDENT said: There is a ceremony to be performed this morning before I call upon the speakers. The Netherlands Geographical Society graciously propose to present the Hondius Gold Medal to Sir Francis Younghusband, and I call upon Dr. Voûte.

Dr. E. JOHN VOÛTE (K. Nederlandsch Aardrijkskundig Genootschap): The President of the Royal Netherlands Geographical Society has asked me, as Honorary Secretary, to replace him as delegate. Yesterday I had the honour to hand to His Highness the Duke of York an address expressing best wishes for the prosperity of your powerful and glorious institution. But our Council knows that the greatness of a Society depends upon the work and on the researches of its members, and at our last meeting it was decided to honour the Royal Geographical Society and one of its most prominent members. We want to present the Gold Medal of the K. Nederlandsch Aardrijkskundig to Sir Francis Younghusband for his scientific work in India, and for his very important explorations in the Himalaya, as well as for what he did as an Honorary Secretary and afterwards as a President of your Society. Further, our Society has resolved to offer the Honorary Membership to Sir Charles Close, President of your Society. Both he and Sir Francis Younghusband have done excellent work in topography and alpine research. And we wish to honour your Secretary, Mr. Hinks, by making him a Corresponding Member. The Royal Netherlands Geographical Society knows that you will accept these nominations.

Dr. Voûte then presented to Sir Francis Younghusband the Gold Medal of the Royal Netherlands Geographical Society, and Diplomas conferring Honorary and Corresponding Membership of that Society were handed to Sir Charles Close and Mr. Hinks respectively.

M. MAURY, speaking on behalf of the Société Royale Belge de Géographie; said: La Société de Géographie de Bruxelles, désirant, à l'occasion des fêtes du Centenaire, exprimer toute sa sympathie pour les dirigeants de la Royal Geographical Society, et honorer en même temps deux géographes éminents, m'a chargé de remettre en son nom le diplôme de membre d'honneur à Sir Charles Close, Président, et celui de membre correspondant à M. Hinks, Secrétaire. Elle m'a prié également de leur exprimer toutes ses félicitations.

M. Maury then handed to Sir Charles Close and to Mr. Hinks Diplomas conferring respectively Honorary and Corresponding Membership of the Société Royale Belge de Géographie.

The PRESIDENT: We now commence a series of papers on the Habitable Globe, and are very fortunate in having persuaded some eminent geographers to come and speak to us. We have three papers on a subject which perhaps is the most important of any which can be graced with the term "human geography." Amongst those geographers there is a very distinguished man of science, Professor Penck, who has promised to give us a paper on the alleged desiccation of Central Asia, and I will first call upon him, and then upon Professor Gregory and Mr. Leakey.

CENTRAL ASIA

PROF. DR. ALBRECHT PENCK

FOR centuries Central Asia has been the centre of unknown Asia; since the last fifty years it has been the object of so many explorations and researches that even the geographer who stands outside can venture to discuss some questions of importance which were in the foreground of exploration. If he will express his opinion on Central Asia as a part of the habitable globe, he must say at first to whom he owes his knowledge. Many men who have staked their lives and have crossed with indefatigable courage and sharp eyes the high mountains and the deserts, ought to be enumerated. If I mention only two it is to show to whom I am indebted most: Sven Hedin and Sir Aurel Stein are my great masters on the geography of Central Asia.

Whoever speaks on Central Asia must confess what is his conception of this region of the world. There is a diversity of opinions in regard to what Central Asia is. Humboldt laid much stress on its central position in the continent, but indicated no sharp borders; Richthofen followed physiographic reasoning which allows a sharper definition. He observed that all products of the degradation of the land remain in Central Asia and are not transported into the sea. But this is true for all regions which have no outlet to the ocean, whatever their geographical position may be. Richthofen excludes indeed those regions from

Central Asia which in recent geological times were drained into that interior sea which stretched during the later Tertiary Period in the east of the Mediterranean; he does not include therefore Turan in his Central Asia. But there are besides this vast tracts of Persia and Asia Minor which since long time have had no oceanic drainage and continue to have none, and in which all the waste of the land remains, though they have a true peripheral situation in the continent and are neighboured by the sea. These countries also are not included by Richthofen in his Central Asia.

His distinction between central and peripheral regions in a continent is based essentially on climatic facts. The waste of a land remains on that land, where aridity consumes the water. Therefore, an arid climate is the cause of all central regions in the sense of Richthofen. An arid climate however is not always characteristic of the central parts of a continent. Most of the arid regions of the globe lie excentrically; in lower latitudes they stretch to the west coasts of the continents and directly border the ocean. I hesitate to identify the central regions of a continent with arid climate; there are as well peripheral parts which since long geological times are under the influence of a climate of extreme dryness. The definition of a central region in the sense of Richthofen fits excellently for the Sahara, but nobody would apply the designation of Central Africa to that desert. Therefore, when looking for a definition of the central part of a continent I lay stress in the first place on its central position and make use of physiographic or other facts only in order to recognize reasonable boundary lines. For different continents different ways of reasoning can be followed. The purpose must always be to recognize the entity of a larger region.

The climate plays a principal rôle. Central Asia rises out of the arid parts of Inner Asia, but it is not a dry region in its whole extent. It gives origin to large rivers; most of them run into the surrounding deserts or desert-like countries. The Amu Darya and Sir Darya end in Lake Aral; the seven rivers of the Northern Tien Shan evaporate with the waters of Lake Balkhash; Lop Nor or its substitute is the terminal lake of the Tarim. Other rivers of Central Asia, the Hwang Ho and Yangtze Kiang, the Mekong and the Salween, the Brahmaputra and Indus, indeed reach the sea; this is due to the fact that they are not totally absorbed in those arid regions through which they pass. They may be compared with the Nile. Large rivers can never originate in an arid climate. Here all precipitation is consumed on the spot by evaporation. This does not always happen immediately. The water of violent rain-showers runs a certain length on the surface before it disappears. Thus we have in nearly all regions of the world with an arid climate ephemeral watercourses, which in Turkistan are called "sai," while its rivers are called "darya." The sais display in their short course the same actions as all running water: they erode and accumulate according to the same laws as the big rivers. They create in arid tracts the same surface forms as are met with in humid regions. But these forms do not unite systematically into larger ones and the land has not that harmony of slopes which is so characteristic of all humid climates. There is no uninterrupted inclination towards the sea or towards an interior basin. Besides this, wind-action becomes effective; sand and dust are easily blown away and redeposited in other localities. Aeolian erosion and aeolian deposition however are in arid

regions subordinate to erosion and deposition by water, as long as sandy and dusty soils do not predominate. Where this is the case, wind-action also becomes visible even in humid regions; it is not restricted at all to the arid one.

From the morphological standpoint the tracing of a boundary around the arid regions is not easy. The desert of Helwan in Egypt is as water-worn as any limestone region in Europe. The action of wind here seems to be insignificant, if it is not recognized in the absence of fine-grained products of decomposition on some surfaces of the limestone. On the other hand, sandy tracts in moist climates often have a desert-like appearance. Easier it is to judge from the vegetation. Forests are always absent from arid regions; the vegetation here is always scarce, more or less uncovered by it are open spaces. Plantless deserts are a climax of aridity. But deserts are not only the products of an arid climate; they occur also in cold regions. It can become difficult to distinguish dry deserts from cold deserts. This concerns especially Central Asia. One fact gives much help here, that is the existence of terminal lakes with salty water. Here not only that water evaporates which falls as rain or snow on the surface of the lake, but also that water which runs into the lake from the humid or nival neighbourhood. In mountainous regions these salty terminal lakes afford good means of drawing the *arid line* which separates the arid climate from the adjoining climate. They lie in the arid region, their feeding grounds beyond. The arid line is not identical with the border line of interior basins, the rivers of which disappear in their dry interior; it lies always within that border line; arid regions occupy only a part of those regions which have no outlet to the sea.

It is not surprising that our knowledge about the arid line in the continents is still very limited. There is an essay on it in North America, a good investigation on it in South America, and it has been traced through Africa. Dr. Lotte Möller is studying the extension of the arid regions of Asia both in the horizontal as well as in the vertical direction; it is to be hoped that the results of her research will appear next year. My observations on the arid parts of Central Asia have only a provisional character.

In Western Tibet there are salty terminal lakes at elevations of more than 17,000 feet. Here the arid line can be expected at a height of more than 20,000 feet. In the neighbourhood is the desert Aksai Chin, which has the character of a dry desert at 16,000 feet. Similar evidence is found in Central Tibet. The country is sprinkled over with salty terminal lakes at heights of 15,000 feet which receive their water from the neighbouring higher mountain chains. The arid line is here everywhere to be looked for at elevations of about 18,000 feet. Towards the east its height diminishes and the arid line may be at less than 13,000 feet; the salty Koko Nor has an elevation of only 10,000 feet. At the frontier of China proper it sinks down rapidly; the old empire lies everywhere above it. Also in the western direction there is a decrease of the height of the arid region, it embraces still the plateau of the Pamirs (13,000 feet) as indicated by the saltness of the Qara Köl. But on the western side of the plateau below the snow-line we meet with humid conditions which extend nearly down to the foothill region. Here at elevations of about 4000 feet the arid line makes its appearance. In the interior of the Western Tien Shan the salty Chatir Köl indicates a height of the arid line of about 13,000 feet. Farther north, the brackish water of the Issik Köl demonstrates that this lake is still in

the arid region which must reach here higher than 5500 feet; but at the northern foothills of the mighty mountain chain it extends only up to 4000 feet. Very high it is however on the southern foothills of the Tien Shan on the Muzduk. Judging from the researches of Dr. Groeber it seems to be here on the south side at more than 10,000 feet. Only in a shaded part there are trees at 9000 feet. In the Eastern Tien Shan the arid line is far lower. There are forests on the north side which extend down to 3300 feet, where the dry appearance of the Dzungaria begins. In the south side however the arid character extends up to heights of 7000 feet or more. Very high also is the arid limit on the opposite side of the Tarim basin on the Kunlun and Altin Tagh. The land is dry here even at elevations of more than 13,000 feet. The arid line does not sink much from the highland of Tibet to the southern rim of the Tarim basin, it does not sink much over the basin and makes its rapid descent to the north in the Tien Shan mountains. Thus the basin of the Tarim has no considerable effect upon the situation of the arid line. The arid country between the Himalaya and the Tien Shan forms a vault with reaches highest in Western Tibet, especially in the rain shadow of the Karakoram, and which bends down on the west side of the Pamirs, on the north side of the Tien Shan, and eastward slowly to Mongolia and steeply to China proper.

This grandiose arch of the arid region is surmounted by mountain ridges covered with eternal snow. The snow-line makes a similar arch over Central Asia which culminates at more than 22,000 feet in that region, where the arid line reaches highest, in Western Tibet north of the Karakoram. From here it dips down gently in all directions. In Eastern Tibet and on the Pamirs it is met with at 18,000 feet; this is also its height on the southern border of the Tarim basin on the Kunlun. It is still over 14,000 feet on the northern border of the ridges of the Tien Shan, but in that mountain chain it sinks down rapidly to the north, as shown by a map of Machatschek. The same occurs west of the Pamirs on a smaller scale, along the Nan Shan in the east, and in the Himalaya on the south. Here the snow-line lies about 7000 feet lower than in the adjoining parts of Tibet. But the bending down of the arid line is far more considerable. It sinks below the Himalayas, and where it reappears on the south-western foothills of that mountain chain in the Salt range it has no greater height than 2000 feet. It curves down 16,000 feet, more than twice as much as the snow-line does.

The arches of the arid line and the snow-line in Central Asia are due to the high elevation of the continent just where the arid belt of the old world ends, the beginning of which is at the shores of the Sahara, from whence it extends through Arabia and Persia. Central Asia is dry on account of the arrangement of the climatic belts and its aridity is enforced by the arrangement of the surface features. The high mountains of the Himalayas, of the Pamirs, of the Tien Shan, and of the Nan Shan keep off the atmospheric moisture from the interior plateau of Tibet and from the basin of the Tarim which is surrounded on three sides by high mountains, and which is only partially open on that side from which no sea breezes can come, that is, towards the north-east. The insignificant moisture that can be brought to Central Asia is precipitated on the outer sides of its mountainous border, and only a very small part can enter the interior. Therefore both the arid and the snow-line lie here very high, and

bend down everywhere on the circumference. By this, Central Asia is a unique part of the world, and it is unique also by the fact that the arid-line comes here very near to the snow-line (3000 feet), so near that it may be questioned what is intercalated between them. It is not a well-watered humid region which extends here. There is a country covered with snow during the winter and pretty dry during the summer. It may be called seminival and can be compared to a certain degree with the arctic Tundra region. The distance between the two limits increases if we approach the circumference. Here it becomes everywhere 7000–10,000 feet, and it is only here that we find a true humid climate between the two lines with forests and the possibility to practise agriculture without irrigation. That zone is absent from the interior of Central Asia.

There is still another region of the world where we meet with similar features, that is the Puna de Atacama, where we have the sea coast in a desert country and where we ascend through arid regions until we reach heights which during the winter are snow covered and are dry during the summer. Here, too, the arid region touches the seminival one, but only a few mountain tops merge into the region of eternal snow, while in Central Asia extended mountain chains are covered with nevé and feed glaciers. This causes the difference between the Puna and Central Asia. There are no rivers arising from the Puna, while Central Asia gives rise to an important number.

Central Asia owes its daryas to the nival and subnival climate of its roof; all derive their water from the melting of snow or glaciers. Their feeding by rain or springs is insignificant. In spring or in summer they are fullest, during the winter feeble. They bring water into the arid region and carry with themselves from the high regions enormous quantities of debris which they deposit in the form of alluvial fans at the foot of the mountains. They have a freight of sand and mud which accompanies them until they disappear. This freight is then seized by the wind which blows the sand into dunes and carries away the mud in the form of dust. This is the origin of the vast deserts of sand which extend in the north of Central Asia, of the kums of Turan, and of the dunes in the desert Taklamakan in the basin of the Tarim. Here and there the sands are accompanied by loess, whilst along those rivers of Central Asia which reach the sea there are neither sand-fields nor loess, with the exception of the Hwang Ho.

Richthofen has the great merit of having recognized loess as an aeolian deposit. But it has not its origin in the decomposition of the rocks of deserts or steppes; it comes like the sand of many dunes from river deposits which are rearranged by the wind. The mud is transported farther by the wind until it was redeposited. This happens even on the barren ridge of the Kunlun up to 14,000 feet, as observed by Sir Aurel Stein; this is the rule in corners at the foot of the mountains which in Central Asia are surrounded by a belt of loess. In the Lop Nor region older river or lake deposits are strongly eroded by the wind, and many loess deposits may come from here, but others are derived directly from the mud which annual floods have left behind, and which was not fixed by vegetation. Rivers which are very broad during the summer and narrow in the winter are the birthplaces of many loess deposits. Thus it is nowadays in Central Asia, thus it was in South-Eastern Europe during the

Ice Age. Then the Danube was swollen during the summer months by the waters coming from the alpine glaciation, and very low in the winter which was dry in the east of the ice caps of Northern Europe and of the alpine glaciation. The mud left by the Danube in the low plains of Hungary and near the Black Sea was whirled up by continental winds and spread over the neighbouring land.

This is also the origin of the loess of China. During the Ice Age the Hwang Ho brought thither in the summer months the waters and the mud derived from the Central Asiatic glaciation, which in winter was swept farther and deposited as loess in great thickness on the hills and mountains of Shansi, Shensi, Kansu, and Honan. From here it is eroded nowadays by rivers in innumerable gorges and brought to the great plains where it becomes again the prey of the wind so that the air is often full of dust. Thus it was during the Ice Age in the basin of the Mississippi. This mighty river was then during the summer full of the muddy melting water of the North American inland ice, whilst it was low in winter. Then the mud left behind by the flood was carried by the wind into the neighbourhood. Along the Mississippi are the loess deposits of North America, and not in the neighbourhood of the salt-steppes of the Great Basin. There is no loess in the steppes and deserts of Africa, and if storms bring dust from the interior of the Sahara, the deposit in Tripoli is not true loess. The origin of the loess is a very complex one; different causes—glaciers, rivers, and wind, nival and arid conditions—must work together. This happened during the Ice Age in the northern hemisphere, but at present it occurs only in Central Asia.

Central Asia is only a part of that belt of arid climate which extends from the Atlantic through the Sahara, through Arabia and Persia, into the interior of Asia. The plains of Turan are arid too, partly desert; but they have no rivers of their own, and on account of their low altitudes they do not touch the nival or subnival climate. Mongolia belongs also to the dry regions of Asia, its Gobi is in part a true desert, but except in its western basins it does not receive rivers from the neighbourhood. Its arid climate is always separated from the nival and subnival one of those mountains by a humid belt with forests. Only in Central Asia the arid zone comes so near to the region of perpetual snow that the humid climate which elsewhere is intercalated between both plays a rôle only on the circumference. That is the consequence of the meeting together of a climate originally arid with very high and continuous elevations. Such conditions do not occur in Turan and Mongolia; in both regions very extensive peneplanations have taken place; the mountains which once existed in the neighbourhood of their sandy deserts are perfectly worn down and the sands of the Gobi are as it seems to be derived from sandstones. Northern Turan and the Gobi represent a state of evolution which Central Asia will reach only after millions of years, and being very far from that terminal state, it differs essentially from its desert neighbourhood. It belongs to that belt of recent elevations which we trace from the Alps through Southern Asia, but from a tectonic standpoint it is no unit. The thrust structure of the Himalayas meets with regions of recent uplift of different kind which on the plateau of Tibet was accompanied by volcanic action.

The snow-line and the arid line are the most important border lines for

human life on the land. The snow-line is nearly impassable for human habitations; only in Europe are a few houses to be found above it: cabins for mountaineers and meteorological observatories. The arid line acts not so sharply. Man can penetrate into the region of arid climate and abide there if water can enter it, either in the form of rivers or in a subterranean way, as ground-water appearing in springs. Springs allow grazing and hunting in extensive arid regions, but they do not afford water enough for the settlement of a great number of men. Only where rivers flow into arid lands and bring much water into them are the conditions given for a large population even in an arid region.

In Central Asia extensive tracts in the arid region are quite uninhabitable. Nearly everywhere a broad belt below the snow-line is devoid of men; where in Tibet the arid line is only 3000 feet below the snow-line, the country is totally deserted. On a surface of 230,000 square miles there is not a single human abode, there are no herds, only now and then hunters or gold-diggers enter that vast tract, and caravans cross it from India to the basin of the Tarim. Another extensive region of Central Asia is as empty of men: the sand desert of Taklamakan is uninhabited and uninhabitable; the same holds good for the rocky deserts east of Lop Nor. At least 150,000 square miles in the basin of the Tarim are totally devoid of men. On 380,000 square miles of Central Asia there is no inhabitant, and on 1,000,000 other square miles there are nearly none. It is difficult to say anything on their number. If we take the data of the anökumene which Machatschek gives for Russian Turkistan, it can be assumed that we may have here two inhabitants to a square mile. This would give two millions in the arid regions of Central Asia, besides those large deserts we have already mentioned, and which are not the only deserts of our region: there are still many others sprinkled over the arid ground. They are included in our 1,000,000 square miles, which may have a somewhat denser population now and then where springs rise or little rivers disappear.

Narrow is that peripheral belt of Central Asia where agriculture is possible without irrigation, and its narrowness is strengthened by its mountainous character. Only on the bottom of valleys and on gentle slopes are fields possible, as in parts of South-Eastern Tibet, in Tajikistan, and in the valleys of the Northern Tien Shan. But nearly everywhere agriculture is helped here by irrigation. Near to that belt of agriculture the arid conditions are less severe than usual, and the population can become larger than elsewhere in the arid regions; there may be altogether 300,000–350,000 square miles within the circumference of Central Asia which on account of their semi-arid to humid conditions could nourish ten to twelve inhabitants to the square mile; they may contain three to four million inhabitants.

The essential scenes of human life in Central Asia are its oases. Most of them lie in lower altitudes, many near to the sandy desert. In general they extend over the alluvial fans which are accumulated by the rivers at the foot of those mountains from whence they come. Here the rivers can be easily divided into the branches necessary for irrigation, or their water trickles down into the loose soil of the fan and reappears farther down in moist places which allow cultivation. Widespread is the method of catching these waters subterraneally by galleries. In Russian Turkistan the cultivated area of the oases is estimated

at 70,000 square miles; it is far less in Chinese Turkistan in the province Sinkiang. Sir Aurel Stein has indicated its extent on a map of the Tarim basin. A rough evaluation gives less than 5000 square miles. If we assume the same figure for the oases north of the Tien Shan, especially in the valley of the Ili, we get for the area of all the oases in the Chinese part of Central Asia approximately 10,000 square miles: a seventh part of the surface of the oases in Russian Turkistan. If the density of the population is assumed to be the same here and there, we have a population of six millions on 80,000 square miles of the oases. More than half the population (11·5 millions) of Central Asia lives in the oases which occupy less than one-twentieth part of its whole surface (1,790,000 square miles).

The following table shows what we believe that the distribution of the population of Central Asia may be in comparison with its actual political divisions and their assumed population.

Deserts	380,000	square miles	—	inhabitants
Other arid land	1,000,000	,, ,,	2,000,000	,,
Semi-desert and humid	330,000	,, ,,	3,500,000	,,
Oases	80,000	,, ,,	6,000,000	,,
	1,790,000	,, ,,	11,500,000	,,
Russian Turkistan* ..	400,000	square miles	7,000,000	inhabitants
Sinkiang	580,000	,, ,,	2,500,000	,,
Tibet	810,000	,, ,,	2,000,000	,,
	1,790,000	,, ,,	11,500,000	,,

All life in the oases depends on the quantity of water which the rivers bring down from the nival and seminival regions. The most important daryas are fed by glaciers. The rivers of Central Asia can be compared with thermometers in which the variations of the expansion of the quicksilver in the bulb are expressed by ample oscillations in the tube. Little variations in the nourishment of the rivers greatly affect their length. These variations may be due to variations in the snowy precipitation of the higher regions or to variations of the temperature there, which increase or diminish the melting of the glaciers. They can be large in wet years or in dry ones. A decision as to which will be the case is impossible on account of the want of observations. Let us imagine that a river of a width of 50 metres which terminates in the sands gains 100 kilometers length, then its surface increases by 5,000,000 square metres. If we assume that the evaporation is the same as on Lake Aral, that is, 1 metre in the year, then evaporation has to take away 5,000,000 cubic metres more than before during the year. That corresponds to $\frac{1}{6}$ cubic metre in the second. Such a little amount of the quantity of water in a river would increase its length for 100 kilometres.

It must be borne in mind however that when entering the Tarim basin the rivers are not only consumed by evaporation but also by the soaking of their

*The former General Government of Turkistan excluded the Transcaspian province and the greater part of the province Sir Darya, excluded Khiva, but included Bokhara. Intentionally only round figures are given.

water into the sand. A lengthening of a river for 100 kilometres will therefore be accompanied by a far greater loss of water than $\frac{1}{6}$ cubic metre per second by evaporation. Let us assume that loss to be ten times as great, then a prolongation of 100 kilometres of a river will be due to an augmentation of its discharge of 2 cubic metres per second. That is a quantity which in a large river cannot be recognized without exact measurement. Therefore, if there are ruined places in the desert of Taklamakan even more than 100 kilometres below the actual settlements it is not necessary to assume a considerable change of climate: a slight diminution of the river discharge can be the cause. This diminution may be due as much to a temporary lowering of the precipitation in higher regions as to the disappearance of some glacier tongues which had extended in a preceding time. I do not believe these quantities of ice to be the relics of the Ice Age; it is not probable that any of them have survived the seven thousand years which we know to be the length of post-glacial time. I think it will be the case of one of those post-glacial extensions of glaciers which now become also known in the Alps.

The question is however a rather complex one. The over-saltening of the soil may be the cause of the migration of a settlement. If in an oasis all water is consumed by irrigation, the soil becomes finally too salt and infertile; the oasis must be left and new irrigation will only be possible at a place upstream. This new irrigation will consume the water which was formerly used in the old oasis, and the latter will become deserted. We make these reflections, which could be easily extended, in order to show that it is not at all well founded to conclude, from the shifting of the oases in the Taklamakan desert, that there have been climatic changes in historical time. Sir Aurel Stein has accumulated such an amount of evidence by his finds in the Lop Nor region and in other oases that there can be no doubt of the persistence of desert conditions in the basin of Tarim for more than two thousand years, and Leo Berg has shown how insufficiently founded is the belief in the desiccation of Russian Central Asia. Minor oscillations in the heights of the snow-line and of the arid line cannot be doubted; these minor oscillations become very effective here on account of the plateau conditions of the high ground and they affect the life in the low regions by means of the rivers.

With its $11\frac{1}{2}$ millions of inhabitants Central Asia has no great weight in the population of Asia and of the whole Earth. In the future too it cannot be otherwise. A region which over more than three-quarters of its surface suffers from a pronounced arid climate can never become rich in men. But it may become more populated than it is now. It may be that by the construction of wells in suitable places the grazing-ground in the arid regions could be extended so that there would be more inhabitants to the square mile—let us say four instead of two; this would mean that we had to reckon in that region with 4,000,000 souls instead of 2,000,000. It is probable that in the semi-arid and humid regions the population could be far denser than nowadays—there are whole valleys in the Northern Tien Shan which have been abandoned by their inhabitants. It seems to be possible that those regions could nourish 10,000,000 instead of 3,500,000—a density of thirty to a square mile is met with in the high valleys of the Alps—but more is not probable. As to the oases, not all the water is used for irrigation. Amu Darya and Sir Darya bring into Lake Aral every second 2000 cubic

metres, that means that on its surface evaporation takes off 1 metre of water from its surface. An area equal to that of the lake could be covered annually with 1 metre of water which is not used for irrigation. That is more than the precipitation would yield, but irrigation in Turkistan uses one litre per second on a hectare, that means in the year 3 metres of water on the irrigated surface. Therefore only the third part of the area of Lake Aral could become irrigated by the water which evaporates useless on its surface. The same reasoning is good for Lake Balkhash. An area of about 11,000 square miles more than at present could be irrigated in Russian Turkistan if all available water was used. But it is a question if this can be possible, for only that water can be used for irrigation which can be brought to a place which can be cultivated. If the surface features do not allow the construction of irrigation canals, water will run away without being used. Therefore an augmentation of the cultivated ground in Western Turkistan by 11,000 square metres, that is by 16 per cent. of its present area, will be the uttermost limit which could be imagined.

The situation in Eastern Turkistan is a different one. Here, too, not all the water is consumed by irrigation. For a distance of 750 miles the Tarim flows through a perfectly dry country before it disappears, but there is no longer a permanent terminal lake, and at the first glance it seems that all running water is evaporated directly from the rivers, which in the whole basin may have a length of 1600 miles. If we assume that each has a width of one-thirty-second of a mile they represent a surface of evaporation of 50 square miles on which only 4 cubic metres could evaporate in the second. The discharge of the Tarim observed by Sven Hedin is far greater. There must be therefore still other surfaces of evaporation besides the rivers. We recognize them partly in those thirty-five ground-water lakes which accompany the lower Tarim, and besides these there are many swampy regions along the river which become inundated during its high-water stage. These evaporation surfaces are far greater than that of the rivers; they do not seem to extend over more than 800 square miles. The mean discharge of the Tarim consumed by evaporation does not surpass 60 to 70 cubic metres in the second, which is in accordance with Sven Hedin's measurements. If it was used totally by irrigation, the cultivated surface could be increased along the Tarim only by 270 square miles. If we take into a similar account those rivers of its basin which do not reach it or lose much water in swamps or "köls" the whole surface which could be added to the cultivated ground of the Tarim basin can be estimated at 1000 square miles, the eleventh part of what can be imagined for Western Turkistan.

There are only limited possibilities of extending the oases of Central Asia. An increase of the cultivated surface of the Earth by 12,000 square miles is not much, and if it were populated at the same density as the existing oases it would afford only room for 900,000 men. But I do not believe that only seventy-five inhabitants to 1 square mile are an adequate number for a well-cultivated oasis. This figure may be doubled or raised threefold, but it does not seem to me possible that the Central Asian existing and future oases could support more than 25,000,000 inhabitants. The maximum capacity of Central Asia for mankind will be less than 40,000,000 inhabitants under the present best methods of irrigation and cultivation and the present standard of life, which is very low in Central Asia.

Also in the future Central Asia will not, by the number of its inhabitants, play an important rôle on the Earth. Its inhabitants will always be divided into nomads, whose herds will graze in arid regions, and farmers, who live in the oases. The number of the nomads will always be low. That of the farmers can become pretty high, but both are limited. The proportion of both parts of the population changes according to the state of civilization. It is now 2:6 and may become 4:25; in former times it may have been 1:2 and more. The sedentary population can easily be subdued by foreign rulers and change their national character. The nomads will never lose all their freedom. Though always migrating, they are the more stable part of the population. The more prosperous the oases are, the less influence however will they exercise. Lying on the highway between the occident and the far orient, Central Asia has been influenced from both sides and its dry soil has perfectly conserved the relics of old civilizations, religions, and peoples. But it did not much influence its neighbourhood. In this respect it is inferior to Mongolia, from which nomadic tribes, not numerous but very active, have conquered vast parts of Asia and have extended their rule even to Europe. In Mongolia the oases do not play the same rôle as in Central Asia; the nomadic population is not controlled in the country itself by the sedentary one in the oases, it is attracted by neighbouring lands which are conquered but not subdued as to the race of their inhabitants. The latter absorb the conquerors and they disappear.

In more than two thousand years of historical times and probably also in those prehistoric ones which extend over the seven thousand years of the post-glacial period, the surroundings of men have undergone no important changes in Central Asia. But in the glacial period the state of things was different from what we see now. There is convincing evidence that the snow-line in the Tien Shan and in the Pamirs lay much lower than nowadays, and there are reasons to believe that this has been so too on the high plateau of Tibet. It must be assumed that the arid line was depressed too. The low regions of both Turkistans were more habitable, the rivers which allowed irrigation greater. Therefore Central Asia seems to have had in that time a more friendly aspect, and it may have had at that time a more important position in human life. But this remains conjectural as long as we have no convincing evidence. There are still many anthropo-geographical problems to be solved in Central Asia.

PALESTINE AND THE STABILITY OF CLIMATE IN HISTORIC TIMES

PROFESSOR J. W. GREGORY, F.R.S.

THE evidence of Palestine as to the stability of climate during historic times is of special value as the conditions of life there during the past 3000 years are recorded in what is still the best-known of all early literature. The Bible contains contemporary records, and traditions that may be accepted as reliable, for two millenniums and a nearly continuous record from about 1200 B.C. to the beginning of the Christian era. The conditions in mediaeval times are revealed by the experiences of the Crusaders and early travellers.

The climate is presented in two strongly contrasting pictures. Palestine has been in recent times an arid semi-desert land with a small poor Arab population. Ancient Palestine, on the contrary, is represented as a fertile densely peopled country, flowing with milk and honey, well forested, and with many populous towns which have either been replaced by small villages or are quite abandoned.

This change is attributed by many authorities to a decrease in the rainfall and water-supply; and that view appears to be supported by the well-established existence of a former freshwater lake that occupied the basin of the Jordan and the Dead Sea. When that lake covered much of Eastern Palestine the lands beside it would certainly have had a heavier rainfall, a moister climate, and better nourished soil.

Minor fluctuations in climate in historic times have been advocated on general grounds by Dr. G. C. Simpson ('Past Climates,' British Science Guild, 1929, p. 33), and larger variations, with some reference to Palestine, by Mr. C. E. P. Brooks ('Climate through the Ages,' 1926, pp. 324–327, 403, etc.). The majority of authorities however holds that there has been no material change of climate in Palestine during historic times. The great Jordan Valley lake was long prehistoric, and the less favourable circumstances during modern times are attributed to less careful use of the available resources.

The view that the climate of Palestine has deteriorated owing to a decrease in the rainfall is held by E. Hull (1886), Oscar Fraas, T. H. Fischer (1879), Fr. R. P. Zumoffen (1899), and has been most persuasively stated by Prof. Ellsworth Huntington, in his work, 'Palestine and its Transformation' (1911). He uses four main lines of argument. The records of the ancient population are claimed to prove numbers far larger than the existing water-supply could maintain; the ruins of ancient towns are held to show that the country was more densely peopled than would be possible under the present meteorological conditions; the land is represented as formerly well wooded; and Palestine as reached by trade routes that have become impracticable owing to desiccation of the regions traversed.

The population of the British mandated territory in Palestine of about 10,000 square miles, according to the census of 1922, was 757,182; the number in 1929 is estimated at 816,064 exclusive of 103,000 nomads. The 1929 estimates include 154,330 Jews and 80,225 Christians, many of whom are supported by remittances from abroad. According to the Bible the population was once much larger. The Israelites during their sojourn in the Desert of Sinai are stated to have numbered 603,550 men capable of bearing arms (Numbers i, 3, 46), and that figure implies a total of over two million. The census of David (about 1000 B.C.) reported 1,300,000 warriors (II Sam. xxiv, 9; the figure given in I Chron. xxi, 5, is 1,570,000), and the population therefore must have been between five and six millions.

These figures are probably as unreliable as the statement in Josephus that 1,100,000 people perished during the siege of Jerusalem by Titus. According to estimates of its population based on its area and the residents per acre in existing Eastern towns (1 person to 50 square yards), the total was probably never more than 40,000 to 50,000; and though the city may have been overcrowded by refugees when the Roman army closed round it, Josephus' figure

is an instance of statistical exaggeration which probably magnified also the census returns of Moses and David. More reliable estimates of the population of Palestine are based on the contemporary records of adjacent countries, for reference to which I am indebted to Prof. W. B. Stevenson. Assyrian records state that at the time of Sennacherib the kingdom of Judah, exclusive of Jerusalem, had a population of 200,150 and had forty-six walled towns, and that the total of captives from the kingdom of Israel taken by Sargon in 721 B.C. was 27,290. These data suggest a population of from half a million to a million, or approximately that of the present time.

The strongest part of the case for the former greater rainfall in Palestine rests on the ruined cities. Prof. Huntington cites especially Gerasa (Jerash) in South Gilead (32° 17′ N., 35° 57′ E.) and Petra in Edom. Gerasa is briefly described by Prof. Huntington in his 'Palestine and its Transformation' (1911, pp. 279–281), and in greater detail by Dr. G. Schumacher—"Dsherash" (*Zeit. deut. Palästina Ver.*, XXV, 1902, pp. 109–177, pl. 6–9). Gerasa at the time of Prof. Huntington's visit was a Circassian village of 1200–1500 inhabitants. Schumacher gave the number as 1500–1600. The former says the place is now "insignificant compared with the ancient city" which Schumacher's map shows to have been much larger than the area now occupied.* The ruins of the public buildings show that they were suitable to an important town. Of the two theatres the larger, Prof. Huntington says, would "easily seat six times the population of the present town."† The limits of the present settlement are imposed, he insists, by the water-supply. The inhabitants in answer to his inquiry why they did not plant more gardens replied, "We have no more water."

Ziza and El Qastal, east of the Dead Sea, tell the same tale (*ibid.*, pp. 211, 282), as they were important ancient settlements. Yet before they became stations on the Hejaz Railway they were almost derelict.

It is the same farther north with Busra (*ibid.*, p. 293) with a population of 1500–2000 living in the ruins of a city, of which one of the theatres could have seated 8000 to 9000 people and which had a population estimated at from 35,000 to 55,000. Similarly 'Amman, the ancient Philadelphia, has now a population of 2000 and had theatre accommodation for 12,000 (*ibid.*, p. 295).

Prof. Huntington supports the arguments from these towns by the observations of Prof. H. C. Butler of Princeton as to the decrease of olive cultivation in Eastern Syria and from his own account of Petra (*ibid.*, pp. 221–225), the southern city famous for its extensive rock temples and tombs. Petra was once a great and opulent city, but at the time of Prof. Huntington's visit was occupied by a few Badawin "who camp with their sheep among the fallen temples for a few weeks each year" (*ibid.*, p. 222). Although it had been raining for the three days before his arrival the only water obtainable was half a mile or more

*The size of Gerasa and its population capacity would be overestimated sevenfold from the map in 'Palestine and its Transformation,' pl. opp. p. 278, as the scale of yards should be approximately a scale of feet. The length of the south-eastern part of the wall according to the scale is slightly under 1000 yards: the length according to the original map is 355 m. or 388 yards.

†Huntington, *op. cit.*, 1911, pp. 279–280. Schumacher, *op. cit.*, 1902, p. 143, says the theatre had 4500 seats. Sir George Adam Smith ('Historical Geography of the Holy Land,' 1897, p. 604) includes it with theatres that would have held from 2000–4000.

from the ruins. The village of Elji was suffering from lack of water required for the irrigation of the fields still cultivated there. Yet there must once have been water enough not only for Elji but for fields and orchards on all sides of Petra and for the city with its "20,000 or 30,000 inhabitants and possibly more." Prof. Huntington attributes the importance of Petra to its having been the meeting point of many lines of overland trade. He mentions as one explanation of its decay the opening of a new trade route from the Red Sea to the Upper Nile; but he considers that the real reason was that the routes to Petra had become too dry (p. 278).

The evidence of these decadent and derelict towns does not appear conclusive of a climatic change. Their decline was probably due to political and commercial changes. Busra, Gerasa, Ziza, and El Qastal were links in the chain of stations on the main road from Damascus to Arabia. Their water-supply works indicate that the geographical conditions were similar to those of the present time and the provision of water was their fundamental municipal problem. The accounts of these ancient towns refer to the size of their artificial cisterns. Prof. Huntington mentions one at Gerasa that is 500 feet long and 180 feet wide; each foot in depth in it would hold over half a million gallons. Schumacher (1902, p. 159) gives its depth as 9 metres or 29½ feet; so it would have held 19 million gallons, and would have provided a population of 20,000 people with nearly 5 gallons a day per head for 200 days.

I know no record of the modern rainfall at Gerasa; but the winter rains are sufficiently heavy, according to Schumacher (1902, p. 112), to convert parts of the area into "knee-deep morass." According to Fischer's map of the rainfall of Palestine (*Pet. Mitt.*, Ergz., No. 58, 1879) Gerasa may be expected to have about 16 inches a year; and that amount is equivalent to a rainfall of over 360,000 gallons per acre. In a town with large low houses, with tile roofs, with prepared impermeable surfaces discharging into reservoirs, and people as expert as the Greeks and Romans in the collection and conservation of water, a large supply could have been collected from that rainfall.

In addition to the reservoir quoted by Prof. Huntington, Schumacher describes two thick-walled collecting tanks on the higher ground to the north of the city, which stored its drinking water. On the floor of the larger tank are springs which are still prolific. The larger tank according to Schumacher's measurements is 295 feet by 157½ feet, and the smaller 157½ feet by 59 feet. Their combined surface of 55,000 square feet would store 350,000 gallons per foot of depth. Schumacher records other baths and springs in the town and springs in the neighbourhood at distances of 3 to 6 miles.

The rise and fall of Gerasa, according to the summary of its history by Schumacher (*op. cit.*, 1902, pp. 119–121) and the references to it by Principal Sir George Adam Smith ('Historical Geography of the Holy Land,' 1897, pp. 594, 598, 599, 602, 604), do not fit in well with the climatic variations adopted by Prof. Huntington. Gerasa is not mentioned in the Bible and was one of the towns founded by Greek colonists considerably after the time of Alexander the Great (died 333 B.C.). According to Sir George Adam Smith (1897, pp. 589, 594) it was first mentioned on its capture during the Wars of the Maccabees by Alexander Janneus between 104 and 78 B.C. It was taken by Pompey in 64–63 B.C. and developed as one of the Roman garrison towns

of Eastern Palestine. Its highest prosperity was in the second century A.D. (Schumacher, *op. cit.*, 1902, p. 120—more precisely between A.D. 130–180, G. A. Smith, 1897, p. 607)—after which, with the collapse of Roman power in Palestine, it appears to have declined rapidly.

Gerasa therefore did not develop as an agricultural settlement during Prof. Huntington's wet wave from 1200–700 B.C. and its fortunes were not determined by his assumed wet period from 1100 B.C. to the time of Christ. It was established and flourished after the rainfall, according to Prof. Huntington, had diminished. Sir George Adam Smith states (p. 596) that Arab robbers scoured Eastern Palestine during the period of the Greek and Roman settlements. Gerasa was one of the fortified military stations built to protect the main trade route, and the site was doubtless selected as it had a practical water-supply.

The size of a garrison town is no clue to the number of people that could be maintained there in a self-supporting settlement. The use of Gerasa as evidence of a climatic change seems to me no more valid than would be the claim by some future geographer that Aden had enjoyed a wet period in recent years because it accommodated a garrison and population of 55,000.

The case of Petra is specially instructive, as Prof. Huntington declares that "it is almost past believing that such a city could exist in so dry a situation." Petra has been studied in detail by Sir Alexander B. W. Kennedy ('Petra. Its History and Monuments,' 1925), who shows that the inhabitants built huge cisterns for water storage. He says that the four great cisterns at Biyara were large enough to supply "a considerable multitude," and even at present, after centuries of neglect, they held water when he visited them in the spring of 1924. Sir Alexander Kennedy's account of Petra shows that "in the days of its glory" for 1000 years after the sixth century B.C., the climate was much the same as it is now; he attributes the importance of the town to its position on the trade route from Southern Arabia and Mecca at a time when maritime enterprise was "fearful." The essential advantage of its position, according to Sir Alexander Kennedy, was that it was especially well adapted to collect and store water. "Nature," he wrote, "had by its tectonic activities endowed it in abundance with the one commodity essential then as now to all human enterprise—namely water." "Its situation," he continued, provided man with "a reservoir in which to store it for the purpose of securing a regular supply at all times." The source of the water was doubtless the snow which still falls regularly on the plateau to the east, and maintains "perennial rivulets issuing from numerous springs in its western flank." The water was stored in huge cisterns and circulated by extensive aqueducts and through tunnels; and these works show that water-supply was the primary concern of the P.W.D. of Petra. After describing the conveniences of the locality for water storage Sir Alexander Kennedy (*ibid.*, p. 2) remarked, "It will be seen from this description that a little human ingenuity would suffice to secure an ample water-supply within the Petra Basin. Signs are not wanting that such ingenuity was, indeed, exercised in full measure, and to it Petra . . . owed the glory and pre-eminence it enjoyed for a millennium under its Nabatean rulers and the eagle of Imperial Rome."

Sir Alexander Kennedy wrote with the authority of a great engineer, and his

monograph implies throughout that the geographical conditions when Petra was prosperous were similar to those of the present time. Its site was determined by its being the one place in the district that had an abundant and easily regulated water-supply; and its development was rendered possible owing to the care with which the available water was tended and used.

For the area west of the Jordan the evidence is more complete than for the eastern provinces, and many authorities have interpreted it as proof that all through historic times the climate has been essentially the same as it is now. This conclusion has been adopted by many of those who have given the most careful attention to the subject, including Sir George Adam Smith (1897, etc.), Max Blanckenhorn (1912), Dr. H. Hilderscheid (1902), Prof. I. Benzinger (1905), Prof. G. Hellmann (1908), B. F. E. Keeling (1909), A. Watt (1903), D. Eginitis (1898), Prof. A. H. Sayce (1895), O. Ankel (1877), and C. R. Conder (1876), and among earlier authorities the botanist J. F. Schouw (1826) and the astronomer Arago (1833).

The Bible shows that throughout the period it records the weather conditions in Palestine were the same as hold there to-day.* It gives no evidence of greater rainfall, except for occasional years, or of a more fertile soil. The country was always liable to droughts and famines, as in the times of Abraham, Jacob, and Ruth. Their severity was graphically described by Joel. All the authorities agree that the distribution of rain throughout the year was the same as it is now. It fell only in the winter, and in summer people and stock were dependent on the water stored in cisterns from the winter rains. When they were scanty the supply did not last through the dry season, as Jeremiah discovered when he was imprisoned in the empty cistern of Malchiah. Water was the source of constant anxiety and of frequent quarrels, as between Abraham and Abimelech; some of the most familiar of Bible stories depend on the scarcity of water, and many historic events were determined by famine in consequence of drought.

The liability to drought was the dominant factor in the development of Palestine, and its southern and eastern borderlands were always desert. Sinai was a wilderness when the Children of Israel wandered through it, and were fed by manna and supplied with water that gushed forth miraculously where Moses struck the rock. The Dead Sea must have had a dry climate in early Old Testament times or the pillar of salt that was regarded as a monument of the disobedience of Lot's wife would not have persisted long enough to have been the subject of that tradition.

The geological evidence shows that the present dry climate of Palestine was established in prehistoric times. According to Dr. P. Range ("Isthmuswüste und Palästina," *Kriegschauplätze*, No. 14, 1926, pp. 22, 31) the formation of that typically arid material, loess, began at Gaza 3000 to 4000 years ago, and it is still being deposited.

A change of climate has been claimed as necessary to account for the disappearance from Palestine of the forests mentioned in the Bible. But Sir George Adam Smith remarks (*op. cit.*, 1897, p. 80) that the word translated forest meant woodland, copse, or jungle, and that "we may safely conclude

*Quotations from the above authorities, and a summary of the Bible records and references to the evidence and literature are given in *G.J.*, 43, 1914, pp. 152–162.

that the land was never very much more wooded than it is to-day": and he adds that so far from there having been a universal decrease in recent times, woods and copse now cover many old clearings as on Mount Carmel.

It may be urged that if the vegetation indicates the climatic stability of Palestine during the past 3000 years, the change in the wild fauna supports the opposite view; but J. Aharoni* is emphatic that the extinction of various animals was not due to climatic changes, or to cataclysms, or to topographic revolutions, but "einzig und allein durch Menschenhand."

The most precise test of the Palestine climate is given by the vine and the palm. Palestine is on the northern edge of the zone where the date palm bears fruit. The palm grows in Palestine, as in Greece and the south of France, but it does not bear dates except along the coast and in the torrid depression of the Dead Sea. Dates are not even mentioned in the Bible, which refers to the palm as a symbol of grace, erectness, and victory, but never as a source of food. If the climate had been but a little warmer the palms would have borne fruit on the highlands of Judea.

The vine, on the other hand, throughout historic times has flourished in Palestine. Joshua's spies carried back with them huge bunches of grapes as evidence of the fertility of the Promised Land. Hence the vine obviously did not grow in the deserts to the south. The palm shows that the climate of Palestine was no warmer than now in Old Testament times, and the vine shows that it was no colder. As the temperature is proved by this delicate test to have remained practically unchanged, the rainfall has doubtless been equally conservative.

This argument has been advanced repeatedly since it was used by the Swedish botanist, J. F. Schouw, in 1828, and though it has been criticized, its validity has not been shaken.

In the course of 2000 years there have of course been temporary changes; seasons in Palestine as elsewhere have been good and bad. But there is no conclusive evidence of any progressive change since the oldest of the Bible records; nor of any considerable periodic changes. So far from Palestine having enjoyed a moister climate and better rains in the times of the Old Testament, there is no modern record of any drought as prolonged and as severe as that in the reign of Ahab.

Another critical question regarding the former climate of Palestine is the date at which the Jordan Valley was occupied by a large freshwater lake. For while that lake was in existence Palestine must have had the moister climate and heavier rainfall of its Pluvial Period. The evidence is however conclusive that this ancient lake was long prehistoric.

The geological evidence has been carefully considered by Blanckenhorn. According to him the Pluvial Period was at its height, with glaciers on the Lebanon, at the time of the Mindel Glaciation of the Alps. The lake waters began to recede only after the succeeding Riss Glaciation and then developed the steppe and half-desert climate of to-day. This change was earlier than the time of Mousterian man. According to Blanckenhorn† it was 50,000 years B.C.,

*"Über das Vorkommen und Aussterben palästinischer Tierarten," *Zeit. deut. Paläst. Ver.*, xlix, 1926, p. 260.

†M. Blanckenhorn, 'Naturwissenschafliche Studien am Totem Meer und im Jordental,' 1912. Tabelle. Blanckenhorn remarked (*Veränd. Klimas*, Internat. Geol.

and the climate of to-day had been established by the Magdalenian in 10,000 B.C. Hence the great lake would have disappeared many millenniums before the historic period.

The early date assigned to the disappearance of the Jordan lake is supported by the salinity of the Dead Sea, as investigated by Mr. W. Irwin.* The water of the Dead Sea contains, according to Irwin, 91 billion (*i.e.* million million) pounds of magnesium. The Jordan discharges to the Dead Sea six million tons of water a day; and its water contains 0·00037 lb. of magnesium per gallon. From these data, and on the assumption that the flow of the river and the composition of the water have been constant, Irwin calculates that the Jordan would have required 50,000 years to supply the Dead Sea with its load of magnesium. The Dead Sea would have had water of normal composition and would have been of its present size 50,000 years ago.

The calculation is by no means simple, for the great lake would have contained some magnesium that would have been concentrated as the water was reduced by evaporation. Moreover the inflow would probably have been larger before the lake had shrunk to its present size. These factors might be expected to be counteracted to some extent by the larger amounts of magnesia washed from the soil, as the land in the Jordan basin became larger and the climate drier. But Irwin's investigations show that the bulk of the salts in the Jordan came from saline springs north of the Sea of Galilee; hence the shrinkage of the southern part of the Jordan lake would not have materially affected the inflow of salt to the Dead Sea.

Though some of the factors that would have affected the age of the Dead Sea as determined by its salinity are incalculable, Irwin's work shows that the existing geographical and meteorological conditions of the Dead Sea and Jordan Valley were established in a time that was long prehistoric.

EAST AFRICA PAST AND PRESENT

L. S. B. LEAKEY

NO one who has seen the Great Rift Valley of East Africa can ever forget that very remarkable geographical feature, the eastern branch of which cuts right through Kenya Colony on into Tanganyika Territory, while the western one runs down the western side of Uganda.

But few, I suppose, of those who have seen it have realized that for the most part this great Rift Valley in the form in which we know it to-day was formed in human times. Of course the earliest faults are probably long pre-Pleistocene, but the mass of evidence which has been recently accumulated from all over East Africa shows that much of the major faulting which was accompanied by great volcanic upheavals took place in Middle Pleistocene and more recent

Congr. 1910, p. 427) that the climate of Palestine and Egypt during historic times has not "wesentlich geändert."

*"The Salts of the Dead Sea and River Jordan," *G.J.*, 61, 1921, pp. 427–440; "The Origin of the Salts in the Jordan," *ibid.*, 66, 1925, pp. 527–533.

times. Man has been living in Eastern Africa for as long a time or longer than he has in Europe. To-day the native races of East Africa differ in every possible respect from the races of Europe, but the farther back we go into the prehistoric evidence the more we find a close resemblance between the peoples of East Africa and Europe.

Just as in Europe the story of prehistoric man and his successive culture phases is bound up with climatic fluctuations which we call glacials and interglacials, so in East Africa the prehistoric story is intimately connected with climatic changes. In the place of glacial and interglacial periods East Africa had pluvial and interpluvial periods, and the habitability of East Africa at any given time depended entirely upon the climatic conditions prevailing at that time.

The climatic changes which took place during the Pleistocene may be briefly summarized as follows. There was a major Pluvial period at the beginning of the Pleistocene which probably was divided into two peaks by a short period of decreased rainfall. Gradually the pluvial conditions grew less and less intense until a dry interpluvial period was reached. This was in turn followed by a second major Pluvial period which had two maxima separated by a short pause. This second Pluvial came to an end in a period of intense aridity, which was followed by two minor wet phases themselves separated by a very dry period.

Thanks to the Great Rift Valley within which are many convenient lake basins which have either no outlet or only an outlet at a great height, the evidence of these fluctuations of climate is very clearly recorded in the form of alternating lake deposits and land surfaces; and within these silts and upon the old land surfaces are the tools of prehistoric man—as well sometimes as his bones—so that the story of his successive culture stages can be clearly read. As far as our evidence goes at present each pluvial period, and even each minor wet phase, is marked by a definite culture or cultures. These develop gradually throughout the period to which they belong and then are apparently cut off during the succeeding period of dryness, so that when the next wet period comes on we find a quite distinct culture. But this is certainly not the whole truth. So far most of the investigations have been carried out within the Rift Valley at an altitude of between 5000 and 3000 feet, and here we do find that as desiccation sets in the culture of the time disappears. But it must not be forgotten that East Africa is peculiarly favoured geographically in that it has every range of altitude from sea-level to 19,000 feet, and it is reasonable to expect that long after the Rift Valley areas had been so affected by the gradual desiccation as to be uninhabitable, the high country would continue to have sufficient rainfall for game and man to live, and so we may presume that they simply migrated to the high country there to continue their development until the climate in the Rift Valley once more became suitable. In this connection too we must remember that there is evidence from all the East African mountain areas that during the Pluvial periods the snow and glacier level descended to about the 10,000-foot contour. Even mountains like Elgon, which to-day have no ice-cap at all, have a series of three old moraines. If we remember that even to-day, when the snow-level is at the 14,000 to 15,000-foot contour, frosts and excessive cold are common at the 10,000-foot level and that frosts occur frequently down to the 7000-foot level, we shall realize that when—during the

Pluvial periods—the permanent snow and glacier level was down to 10,000 feet the high country between 10,000 and 7000 feet was probably too unpleasantly cold for prehistoric man to chose it when there were warmer areas available, wherefore he concentrated at lower levels in Rift Valley and elsewhere during the pluvial periods. In fact, from the point of view of habitability, broadly speaking we may suggest that East Africa was habitable throughout the Pleistocene, but that habitable areas varied according to whether a Pluvial or interpluvial period was on.

The culture sequence of East Africa, when it is compared with that of Europe, throws some interesting light upon human geography. The same general sequence occurs in both areas, but *homo sapiens* seems to have been earlier in East Africa than in Europe. The human remains of the earliest Kenya Aurignacians are not yet known, but we have skeletons of a slightly later phase of the Kenya Aurignacian period, and we find that they represent a race whose physical characteristics were anything but negroid, and who are probably best regarded as a type related to and possibly ancestral to the Hamitic of North-Eastern Africa and also of the earliest Aurignacian hunters who went to Europe from Africa.

It must be emphasized that when we say the early *homo sapiens* inhabitants of East Africa were non-negroid we do not refer at all to skin colour but to physical characters, for with only skeletons to judge from we cannot say if they were black, brown, or white in skin colour.

There are those who argue that they must have been black or dark brown because of the latitude, but this argument is, I think, not a valid one, as I shall endeavour to show when I deal with the habitability of East Africa at the present day.

If we pass from the early prehistoric to the just prehistoric period we find that there is very interesting evidence as to the very recent changes which have taken place in connection with the habitability of East Africa.

I spoke just now of two smaller wet phases which succeeded the desiccation at the end of the second major Pluvial period. The maximum of the second of these wet phases seems to have been about 1000 B.C., and there is ample evidence that at that period the rainfall was much greater than to-day, so that big areas which are to-day practically waterless during a large part of the year had an abundant rainfall and a big and flourishing population. The evidence is to be found in many forms—camp sites, wells, dams, etc., are to be found in places where to-day there is no water even in the deep wells.

One of the best examples perhaps of the difference in habitability in East Africa between the Neolithic period of about 1000 B.C. and the present day may be found in a study of the sites round the town of Nakuru, which lies in the Rift Valley in Kenya, a little south of the Equator. In the Neolithic period there was a big settlement living near the edge of the lake shore of the time some 145 feet above the present high-water-level and about 2 miles away. To-day that site is far from the nearest natural fresh water, and the settlers who have farms there now depend for their water-supply upon rainwater caught in tanks and upon water from wells and from artificial water furrows from the hills many miles away. There is ample evidence in the fish remains found that Lake Nakuru in Neolithic times had fish, and we may also presume

that their water-supply was the lake itself. To-day Lake Nakuru at its deepest point is only 9 feet 2 inches; its soda percentage is so great that it is completely undrinkable, and it contains no life save hippopotami and algæ, a few rotifers and diatoms.

Similar evidence of a very marked change in habitability since Neolithic times is to be found all over East Africa, and more especially in the great northern frontier province of Kenya Colony and the northern province of Uganda.

If we turn to East Africa as it is to-day we find that in Kenya for example the average population density is only twelve to the square mile. This cannot be taken as indicating that Kenya could easily carry a far greater population. Most of the areas where there is still a sufficient rainfall and requisite physical conditions to insure a permanent all-the-year-round water-supply are occupied by native agricultural tribes who by the very nature of their life must live in areas where there is always permanent water even in the driest of dry seasons. These areas are on the whole very densely populated, and in some parts of the Kikuyu and Kavirondo reserves there is a density of from 200 to 500 to the square mile.

Apart from these more favourable areas there are vast tracts with a very sparse nomadic pastoral population. Under purely natural conditions as at the present day these areas could not carry a much bigger population either of humans or of cattle than they are doing. The reason is partly that there is insufficient pasturage and too little rainfall for normal crops, but mainly because there is far too little permanent water.

Given gigantic water conservation schemes and also modern methods of well boring, etc., a considerably greater population could be carried, but even then it could not be made as eminently habitable as it was between two and three thousand years ago.

Besides these two greatly different types of country to-day there are vast areas in all the East African territories where small agricultural or semi-agricultural communities manage to live and grow ample crops during each season to carry them over to the next one. These areas would most of them be capable of carrying a far bigger population were it not for the fact that available water during the dry seasons is so very limited that the presence of one or two extra families would result in the using up of all water-supplies long before the next wet season, so that disaster would result.

The present-day habitability of East Africa, then, as far as the African is concerned, is controlled almost entirely by the water-supply factor, and there is no doubt whatever that its potential habitability has decreased greatly since the Neolithic period, since vast areas which could then carry a big permanent population can now only carry a small permanent one or a nomadic one.

So far in speaking of the modern habitability of East Africa I have referred only to the native African's point of view. We must now turn to the question of habitability from the point of view of the European settler. Naturally his position is a far stronger one, for with pipe-lines, wells, tanks, and dams he can arrange for a permanent water-supply in almost any part of East Africa provided he has the funds to carry out the necessary well boring, dam construction, etc. But even then the question of annual rainfall and its distribution over the years

affects him considerably, since even though a water-supply for drinking purposes can usually be arranged by the methods indicated above, it is seldom economic to grow crops entirely by means of an artificial water-supply. Nevertheless the greater part of East Africa even to-day has a rainfall which—if proper precautions for water conservation can be made—is ample, and so the question of the habitability of East Africa as far as the European settler is concerned is not controlled by the water factor in the same way. And already there are many farms in East Africa in areas which from the African point of view were only habitable by nomadic tribes at certain seasons of the year.

But in East Africa there are other factors which may quite possibly affect the habitability from the European point of view. Although every range of altitude from sea-level to 19,000 feet is to be found in East Africa, the variation in latitude is not great, the widest range in East Africa being from about 5° north to 10° south. Within this latitudinal range the sun's heat is very great, so that it is only those areas which are high enough above sea-level for the heat to be somewhat counterbalanced which are normally considered to be suitable for permanent white occupation. By permanent settlement I mean that women and children can live there in perfect health all the time without ever going back to Europe.

It is very frequently taken for granted—especially by those for whom the wish is father to the thought—that the Highlands of East Africa are a white man's country in this sense, and a parallel is usually drawn between the Highlands of East Africa and the South African plateau lands. I do not say that the East African Highlands are not suitable for permanent white settlement just as South Africa is, but it would be well to remember that the combined effect of high altitude and a latitude practically equatorial upon the health, and especially the nervous health, and mental capacity of the white races has not yet been properly studied, and that until there have been several generations of whites in East Africa none of whom have ever come back to Europe the question cannot be settled.

Meanwhile it is noticeable that those who speak most loudly about the suitability of the Highlands of East Africa for a permanent white population are those who periodically come back to this country and so are not the best judges, since they are not really permanently living in Kenya, while those who are not fortunate enough to be able to come back periodically to Europe, and who have been out for a large number of consecutive years, can often be heard to say how much fitter and better they would be if only they could get away to Europe for a change of climate. Yet others in the same category show to all with whom they come in contact that something—possibly the combined effect of altitude and climate—possibly nothing more than the more easily counteracted effects of loneliness and isolation and accompanying evils—something has affected them so that they are nervy, highly strung, and even often unbalanced.

The President then called upon Dr. Hugh Robert Mill.

Dr. H. R. MILL: I feel that on an occasion like this the spirit of discussion, in the ordinary sense of the term, is hardly that in which we should receive the

readers of the extremely interesting papers which we have just heard. Amongst my contemporaries I have watched the growth of these intellectual giants, Penck and Gregory, as they progressed through all the realm of physical geography, adding every year by their extensive and intensive travels more facts to the common store, ever improving their power of exposition and felicity of presentation. I do not wish to question the soundness of their conclusions. Yet while we must accept as true their deductions as to the changelessness of our variable climates, I cannot but regret the passing of the delightfully definite interrelation of climate and human history on which I was nourished. I am saddened by having to forget Marsh's fascinating story of how the climate of Palestine had been changed by the wicked hand of man, and Kropotkin's epic of the progressive desiccation of Asia driving successive hordes outwards to create the civilizations of China, of India, and of Europe.

So far as my own study of rainfall has gone I am impressed by the importance of considering the length of successive periods of increasing or diminishing precipitation. Even during a short time, say thirty-five years, in a country such as Great Britain where the climate varies so little from year to year, we always find an alternation of short runs of wet years and dry years, although on the average each successive group of thirty-five years as far back as our records go shows no substantial difference. It would appear from the researches which have been so admirably summarized by Professors Penck and Gregory that in spite of the great fluctuations, sometimes including long periods of drought, sometimes long periods of excessive rainfall, that when a very long stretch of human history is envisaged, the various parts of Asia which have been considered have preserved on the whole the same climate as now. But all agree that when we take the geological standard of time instead of the historical, there have been far greater variations of climate, including enormous slow fluctuations in rainfall, which have been amply sufficient to affect the distribution of the human race. I do not say that this presumed prehistoric influence is yet fully proved, but if those Goliaths amongst physical geographers to whom we have been listening should be inclined to maintain that no change in climate is capable of directing movements of population in Asia, I think they must prepare to strengthen their armour and pull down their vizors in the presence of Mr. Leakey, for that young David from Cambridge has been gathering smooth stones from the extinct brooks of Central Africa which he will not be afraid to sling at the most doughty opponents.

Geologists have been famous for their controversial methods from the time when, a century ago, the Geological Society lent a helping hand to guide the first steps of the R.G.S. But however the debates between geologists, meteorologists, and archaeologists may be conducted, and whatever the results, we as geographers rejoice to feel that there is still much in this world of ours which remains to be discovered and discussed, and to know that we may look forward to a second century of stimulating and entertaining meetings, no whit inferior to those of the past. Our thanks are very cordially due to the three distinguished investigators who have enlivened our forenoon to-day.

The PRESIDENT: If no one else would like to discuss the papers that we have listened to, I will thank Professor Penck, Professor Gregory, and Mr. Leakey for the admirable communications which they have made to our Society. We

shall have better opportunity to study them when we see them in print, but I am sure we all feel that we have listened to papers of very great importance, and that you wish to show your appreciation of these communications. (Applause.)

On the afternoon of October 22 the Delegates were shown the principal objects in the Collections of the Library, Map Room, and Museum. In the evening a Reception was held in the House of the Society to meet the Delegates to the Centenary Celebrations. The President and Lady Close received the guests from 9 to 10 o'clock in the new Hall. The large company present included many of the Ambassadors and Ministers accredited to the Court of Saint James, with their ladies; past and present Ministers of the Crown; members of the Army Council, the Board of Admiralty, and the Air Council; the permanent Heads of Government Departments; Presidents and Officers of the Learned Societies in London; and many others, about 1700 in all. Refreshments were served at buffets in the Ambulatory, Map Room, Reading Room, and Council Room. Musicians were placed in the Gallery of the Museum, and the principal objects of interest were displayed in the different departments. At 10.15 p.m. Dr. Hamilton Rice exhibited in the Hall several reels of the film taken on his expedition to the Uraricuera and Parima rivers: and afterwards General Bruce showed the latter part of the film of the Second Mount Everest Expedition.

THE HABITABLE GLOBE (*continued*)

On the morning of Thursday October 23 at 10.30 a.m. Delegates and Fellows met again in the Hall of the Society to receive further communications on the subject of the Habitable Globe.

POPULATION PRESSURE

PROFESSOR A. M. CARR-SAUNDERS

THE last few months have seen the appearance of two significant books—one by an American and one by an Australian—devoted to the problem of population pressure.* We need not look far to account for the interest now displayed in this matter. Since the problem of population pressure is essentially the problem of population in its international aspect, the renewal of interest in population problems and in international problems since the war sufficiently accounts for it. The attention of those who discuss this matter is caught by the very uneven distribution of the population of the world. Taking these facts into account and assuming that full use should be made of the resources of the world, they put forward suggestions towards that end. Failing a solution on

*Thompson, Warren S., 'Danger Spots in World Population' (1930), and Wilkinson, H. L., 'The World's Population Problems and a White Australia' (London, 1930).

these or other lines, they fear that the friction already manifest may lead to war. It is my purpose to examine some of the views and suggestions now in circulation. There is a problem; but there is reason to suppose that it is sometimes wrongly stated and that some of the proposed solutions would prove to be no remedy.

The uneven distribution of the world's population is very marked. Perhaps over a half inhabits under a thirtieth of the surface. A few regions are very densely populated, the rest very sparsely populated. One has only to glance at current discussions in order to see that there is a danger of assuming that density implies over-population and sparsity under-population. But there is no necessary connection between them if we use these terms, as they should be used, in their technical economic significance. If the degree of skill in use is low, a sparsely populated country may well be over-populated. On the other hand, where skill is high and natural resources abundant, very high densities may occur without over-population. Every country requires careful examination before judgment can be passed as to its position. While it is possible to show that certain Asiatic countries are in parts grossly over-populated, it is difficult to show that any European country departs very far from the desirable density.

Just as there is little connection between density and over-population, so there is little between over-population and pressure, if by pressure we mean a condition of things which produces organized population movements or the desire for them. There is much to be said for the apparently paradoxical view that, where gross over-population exists, no organized population movements are generated. Gross over-population leads to internal weakness, apathy, and helplessness, and in that atmosphere no vigorous movements of expansion are likely. Ireland a hundred years ago, parts of India and China to-day, are examples of gross over-population, and support this view. When, on the other hand, we look at the condition of those countries complaining of population pressure, we almost invariably find a dense and increasing population which may or may not have reached a condition of over-population. If there is over-population, it is seldom more than slight. Germany before the War complained of pressure, but it is not easy to show that any over-population existed. Italy to-day makes a similar complaint, but in her case there may be incipient, but certainly not gross, over-population.

It therefore seems that circumstances may conspire to make nations which are at the most only slightly over-populated, imagine they are suffering seriously on this account. This is not unimportant, because it has a bearing upon the question of remedies. If the fear is well founded, a more accurate appreciation of the position can remove it. But where over-population exists, there is the problem of outlets for the surplus, and, where it is only feared, it may still be advisable to provide for outlets.

Let us therefore look at the other side of the picture. There is very little reason for supposing that there are many regions of the world that are under-populated in the economic sense. There are regions such as the East Indies, with the exception of Java, where, though the natural resources are considerable, the population is sparse. This is because the skill of the inhabitants is low. But if it was increased, such places could accommodate much larger

populations. Here then is a possible outlet. In the so-called new countries where the aboriginal populations have been pushed aside, there are also possibilities of absorbing the surplus population of densely populated countries.

How far can these two classes of area serve as outlets? Let us take the first class. There are many parts of Africa, of the East Indies, of South Eastern Asia which could maintain much larger populations. Their inhabitants show few signs of making fuller use of them in the sense of advancing towards industrialization. Are they to remain sparsely populated though not underpopulated? Is a fuller use not to be made of them? Will those countries which believe themselves to be suffering from pressure, be content to let matters rest as they are? It is a possible line of policy to interpenetrate these areas with persons bringing a greater degree of skill drawn from the densely populated countries. This is, roughly speaking, what is being attempted in Palestine. It is not proposed to restrict the room for the present inhabitants or to push them aside, but to find room, so to say, for immigrants in between the present inhabitants. Such a programme is an economic possibility and has an attraction for some people, as can be seen from the book of Professor Warren Thompson. It does not obviously run counter to our views as to justice in these matters. We can no longer tolerate a policy of driving off the inhabitants of any area as was done when America and Australia were occupied. This proposal is different. It is to fill the gaps which a primitive form of economic organization leaves.

To this policy however there are strong objections. There is much to be said for the system of tutelage whereby under foreign guidance peoples of a low degree of skill and organization are enabled to make a better use of their territories. But this system gives occupation to few foreigners outside their own countries and gives no relief so far as numbers go. The policy envisaged above however does provide relief, because it assumes the immigration in large numbers of foreign workers. An American school of thought looks to relief for countries suffering from pressure from an occupation of territory which would involve, not merely mandatory privileges and duties, but an organized and large-scale immigration of workers. Thus it has been proposed that in certain cases relief should be found in the occupation of tropical territories. If these proposals were carried into effect, there is every likelihood that we should see a repetition of the difficulties that have occurred in Palestine. Racial, cultural, and economic conflicts are only too probable. They are in fact inevitable, and from the point of view of international peace, which is what the proposals set out to secure, the remedy might well be worse than the disease.

Do the new but partially developed countries offer any better outlets than the old but sparsely populated countries? I can only offer a few observations on this huge subject. The answer depends upon the absorption capacity of the new countries and upon the trend of population in the old countries. Among old countries let us take the population position in Europe, since there almost alone is there pressure of such a nature as to make likely outward movements supported by force if it is not otherwise eased. Sufficient notice has not been taken of the decline of the birth-rate in Europe. In all the countries of Northern and Western Europe the situation is now such that, if fertility and mortality rates now prevailing were stabilized at their present levels, the population would before many years begin to decline. In other words, there is no longer

in these countries a replacement birth-rate, and while mortality rates cannot be rapidly decreased, the birth-rate continues to fall. The position in Southern and Eastern Europe has not yet been examined with the same care, but the tendencies are in the same direction, except in Russia and one or two small states. This means that, Russia aside, any surplus that may now exist in Europe is temporary. Therefore the problem of disposing of the surplus and relieving pressure in Europe is limited in amount and in time.

Let us turn to the new countries. There is no doubt that the optimum population of the new countries is greatly in excess of the present totals, though to reach the optimum must be a slow process. Conservative estimates, for example, put the desirable population of Australia at 25 millions and the possible rate of growth at a little over 2 per cent. per annum. But the new countries are experiencing a fall in their birth-rates similar to those which are occurring in Northern and Western Europe. The United States, for example, have now only a replacement birth-rate, which means that, when the peculiar age distribution of the population has passed away, there will be no addition through excess of births over deaths. In other words, the signs of the times are that the new countries are not going to fill up through the natural increase of their present inhabitants and that they will be able to take immigrants from Europe to an extent that will go far to relieve such pressure as exists. I said "will be able," since it is by no means certain that they will be willing. Hence the extreme importance of immigration laws at the present time since they may block the most promising outlet that exists for the relief of pressure.

So far as the white races are concerned their position may be summed up in the following way. They control vast territories. On these areas they can raise all the foodstuffs essential for a much larger number of persons than these races taken together now represent. But certain areas occupied by these races are congested and there is pressure in them. But owing to the decline in the birth-rate the pressure will not be greatly increased and at no very distant date the pressure will cease to grow. Therefore, granted reasonable access to the new countries where there is no congestion but rather need for larger populations, the pressure can be relieved. In other words, if international understandings can be reached on the subject of migration, the future of the white races is bright.

The same cannot be said of the non-European races. They are not controlling their birth-rates. There is serious over-population in large areas occupied by these peoples. But this does not constitute a world danger just because the over-population is serious and has produced, not pressure that leads to movements with force and will behind them, but internal weakness. The effect of this over-population is disastrous for those who suffer from it, but it only indirectly affects the rest of the world. All the world must feel the result of the inevitable lack of prosperity in these countries. Japan is an exception to this generalization. In that country there is incipient over-population and it produces a pressure that is felt by a vigorous people. What outlets have they? The new countries are not open to them. Korea and Manchuria have been suggested as offering possibilities of colonization. But that would imply interpenetration, and we have noticed the dangers of that policy. Recent news is to the effect that the Japanese Government having previously determinately

opposed family limitation, is now changing its mind. This may afford a solution in time, but the control of the birth-rate must come somewhat slowly, and it will be some decades before the pressure ceases to increase.

THE EXTENT OF THE CULTIVABLE LAND

PROFESSOR C. B. FAWCETT

THE habitability of the Earth is ultimately measured by its capacity for the production of human food. And the extent of its cultivable land is the most important factor in its food-producing capacity. Some part of the food of mankind is obtained from the poorer lands, chiefly from grazing animals; and part is obtained from the fish of the seas and of fresh water. But these other sources of our food supply are of very small importance in comparison with the vegetable and animal products of the cultivated land, from which by far the greater part of human food is obtained. Thus the extent of the cultivable land is a prime factor in determining the habitability of the earth. And the measurement of this extent is an essential part of the study of the world's capacity for supporting population. It is the aim of this paper to set out a first approximation to a measurement of the area of the cultivable land of the world.

The total land area on the Earth is about 56 million square miles. This figure may be slightly modified when further surveys give more exact knowledge of the extent of the Polar Lands; but major exploration is now so far complete that there is no likelihood of the discovery of any new lands large enough to add appreciably to the total. Much of this land is desert. And in regions where the climate favours or allows cultivation there are considerable areas of barren soils and rugged lands. Thus only part of the total land area is capable of cultivation. Only in the more advanced countries is there a complete detailed survey of the land from this point of view, and the area covered by such surveys is hardly an eighth part of the whole land surface. Hence our estimate must be based to a large extent on indirect evidence; and therefore it can only be an approximation to the actual facts, limited by the inadequacy of the available information.

The chief natural factors which determine the possibilities of cultivation are those of heat, moisture, and soil fertility. The heat (and light) received from the sun is essential to life on the Earth; and both in quantity and distribution it is entirely outside human control. Over no part of the Earth is the heat too great for the cultivation of useful crops; but there are large areas over which it is insufficient. This factor is best measured by reference to the temperature and length of the growing season for the hardier cultivated crops.

The mean temperature of the growing season can be estimated from temperature records and from maps of surface temperatures. On the accompanying map the surface isotherms of 10° C. (50° F.) for the summer months are marked. The lands on the poleward side of these lines in both hemispheres are quite incapable of cultivation because their summers are neither warm enough nor long enough for the complete growth of even the hardiest crops. But in fact the northward limit of agriculture in the northern hemisphere lies well to the south of the line shown. It is determined by the shortening of the growing season;

and here the length of the period between the last frost of spring and the first frost of autumn—the frost-free period, which includes the growing season—becomes too short for effective cultivation in latitudes where the warmth of the long summer days is still sufficient to ripen hardy crops. A generation ago the northward limit of wheat cultivation in Canada was near the line which marks a frost-free period of 120 days; now it is near that of 90 days. Further progress in this extension of the cultivable area is likely to be more difficult and slower, yet it is conceivable that the limits for some crops may be pushed to (say) 60 days. But this is still well south of the July isotherm of 50° F. (10° C.), and north of that line there is insufficient warmth for cultivation, independently of the duration of the summer.

Thus the areas on the poleward sides of the isotherms marked may be regarded as permanently uncultivable land. They form the Cold Deserts, and cover an area, including the South Polar Continent, of approximately 10 million square miles, nearly two-elevenths of the whole land area.

The second main factor influencing the extent of the cultivable land is the distribution of rainfall, since water is also essential to life. A full study of the relation of rainfall to the cultivable land should take into account the amount and seasonal distribution of the rain, the amount of the evaporation, which is mainly dependent on temperature and humidity, and many other factors such as its reliability, the mode of fall,* the permeability of the land surface, and the character of the vegetation. In this paper it is only possible to mention the chief of these facts.

Every one realizes that insufficiency of moisture forbids cultivation of the soil, and therefore the arid deserts may at once be written off as uncultivable land. But it is not so generally realized that an excessive rainfall, particularly where it is also a constant rainfall, *i.e.* where there is no dry season, is also a serious hindrance to successful cultivation. In Cool Temperate regions such as the north-west margins of the British Isles such a rainfall produces areas of peat bogs which are as much desert as the sub-arctic tundra or the tropical Sahara.

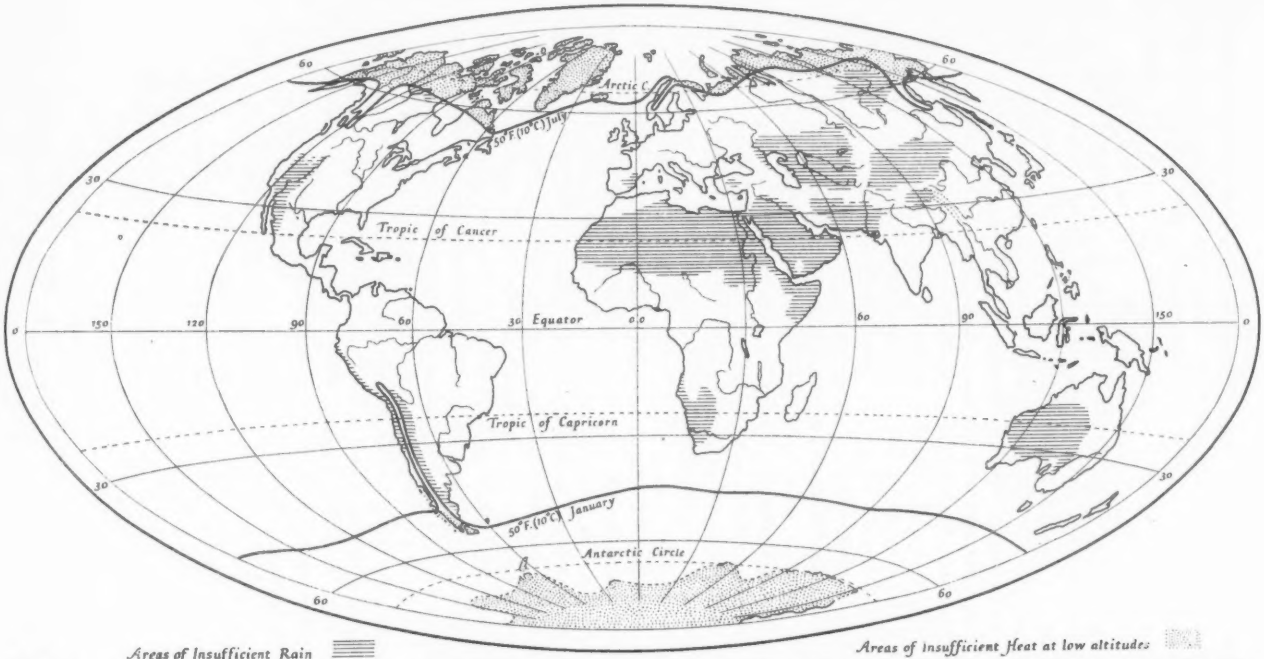
To estimate the extent of the areas which are uncultivable because of deficiency or excess of rain, it is necessary to adopt some definite isohyets as limits. And bearing in mind that local variations in relief and in rock structure, and the season at which the rain falls, may be of great importance, especially in the marginal cases near to excess or deficiency, the following is suggested as a tentative scale. It is related mainly to the conditions of cultivation of the chief cereals and is based on studies of the distribution of cultivated lands.

Rainfall is excessive

In Cool Temperate† Lands	if more than				50	inches	or	1250	mm.	a	year
„ Warm	„	„	„	„	80	„	„	2000	„		„
„ Hot Lands		„	„		100	„	„	2500	„		„

*There is a real difference in value between equal amounts of rain falling as (*a*) the torrential storms characteristic of some semi-arid lands and (*b*) the gentle showers of humid cool-temperate lands.

†The classification of lands as Cold, Cool Temperate, Warm Temperate, and Hot used here is that of the late Professor Herbertson's Thermal Regions. The isotherms and isohyets used have been drawn from those on his Oxford Maps, in the Meteorological Atlas and other atlases, and, particularly in Canada and Australia, with reference to the Year Books of several countries.



Sketch-map of the World showing areas unsuitable for cultivation through (a) *insufficient rainfall and* (b) *insufficient heat at low altitudes*

Rainfall is insufficient
In Cool Temperate Lands if less than 8 inches or 200 mm. a year
„ Warm „ „ „ „ 12 „ „ 300 „ „
„ Hot Lands „ „ 18 „ „ 450 „ „

Areas of excessive rain are relatively small and scattered. Also most of them are so rugged as to be uncultivable for that reason also. Hence they are not further considered here. The areas of insufficient rain are shown on the accompanying map and have been measured on the MS. maps from which this has been prepared. They are as follows: In Cool Temperate Zones: 2·0 million square miles; in Warm Temperate Zones: 8·0 million square miles; in the Hot Belt: 2·1 million square miles. There are also 1·3 million square miles of land with insufficient rain in the sub-arctic regions of North America and Eurasia in the area which has already been marked off as part of the Cold Desert.

These figures indicate that the area of the Dry Deserts is approximately 12 million square miles and, adding to this the 10 million square miles of the Cold Deserts, there is a total area of some 22 million square miles, nearly two-fifths of the land surface, which is permanently uncultivable because it lacks a sufficiency of heat or of moisture.

Of the remaining three-fifths of the land large areas are uncultivable because of high altitude, which in this respect produces conditions similar to those of high latitudes, or because of poverty of soil, and other conditions. It is obviously impossible to measure these on any world scale; but it is possible to obtain some indications of their extent from statistical records for all those countries which have adequate records.* For three important regions such records are available; and we may next consider these areas.

Continental Europe, west of Russia and south of the Baltic and excluding the Mediterranean peninsulas, forms a compact region over the whole of which the temperature and rainfall are sufficient for agriculture. Also, this is a region of dense population and age-long settlement in which the pressure of population has brought into use practically the whole of the good land. It is occupied by seventeen countries, for all of which records are available, and calculation from the statistics for these countries recorded in the 1929 Year Book of the International Institute of Agriculture gives the following table:

	Arable.	*Permanent grass.*	*Wood and forest and "other."*	*Total.*
Area in 1000's of hectares ..	108,014	49,750	109,207	266,971
Percentage of total area ..	40·5	18·7	40·8	100

"Other" is land put to other uses than those mentioned. For some of the countries this is further subdivided, for some it is grouped with that occupied by Forests. Most of it is waste of various kinds, or land occupied by buildings and roads. The Permanent Grass includes at one end of the scale rich meadows and pasture and at the other very poor grazing land merging into scrub and

*The best collection of these records is in the Year Books of the International Institute of Agriculture, Rome. Except where other reference is given, subsequent figures are from this source.

Sketch-map of the World showing areas unsuitable for cultivation through (a) insufficient rainfall and (b) insufficient heat or altitudes

waste. In the few cases where Meadow is distinguished from the poorer grass lands it appears that this better land occupies rather less than half the total area of the grass land. Thus it may be assumed that half the area indicated as Permanent Grass is cultivable and the other half is poor land which would not repay cultivation. On this assumption, the cultivable land amounts to 49·8 per cent. or practically half of the total area of this part of Europe.

A second region comparable to the part of Europe just referred to is British India. These two regions resemble one another in area, in population, in being areas of long-settled agricultural peoples, and also in the fullness and reliability of their statistical records. The part of Europe referred to contains no desert: but some small portions of British India, chiefly in Sind and the Punjab, are parts of the Indian Desert. The Indian figures distinguish the cultivable waste from unproductive land; and the cultivated land, plus the fallow and the cultivable waste, occupies 66 per cent., or approximately two-thirds, of the total area of British India.

The United States of America (exclusive of Alaska and the insular territories) forms a third region, comparable in many respects to Europe and British India, for which data are available. A few years ago the Department of Agriculture at Washington conducted an inquiry into the extent of the cultivable land of the U.S.A., the results of which were set out in its Year Books for 1922 and 1923.* The conclusion is that only some 40 per cent. of the area of the continental U.S.A. can ever be used for crop production.

I do not know of any other region comparable in extent to any one of the three mentioned above for the whole of which there are surveys of similar reliability. A recent work on Canada† credits that country with only 300 million acres of land suitable for farming or grazing; this represents only 13 per cent. of the total area of the Dominion; and if the northern half of the country and also the barren lands of the Canadian Shield are left out of account, it would seem that somewhat less than half the remainder of Canada is cultivable land. Australia resembles Canada in containing a large area of desert land: and it is probable that the cultivable area of this continent does not exceed 20 per cent. of the whole.‡

Scattered data exist for smaller areas.§ On the whole they confirm the view that the three regions of Europe (as defined above, p. 507), British India, and the U.S.A., for which surveys exist, are more, rather than less, favoured than other non-desert regions of the world. And in these three taken together only half the total area is cultivable. Hence calculation, based on the assumption that the proportion of nearly 50 per cent. of cultivable land

*The section most relevant to the subject of this paper was issued as separate No. 896 from the Year Book of 1923. See also "Land Utilization in the United States," by Dr. O. E. Baker, *Geographical Review*, XIII, 1923, pp. 1–26.

†Harper Cory, 'Modern Canada,' London, 1930, p. 65.

‡This figure is based on map measurements by the writer on maps in Australian Year Books and official pamphlets. See also Griffith Taylor, especially "Geography and Australian National Problems," *Rep. Aust. Ass. Adv. Sci.*, Vol. XVI, 1923; and "Agricultural Regions of Australia," *Economic Geography*, April and July, 1930.

§Many references are scattered through geographical text-books and articles and elsewhere. Several are noted in the present writer's article "On the Distribution of Population Over the Land," *Sociological Review*, Vol. XVII, 1925, No. 2, pp. 85–104.

which applies to these regions applies to all the world outside the cold and dry deserts, probably exaggerates the total area of such land.

This calculation may be conveniently summarized as follows: Total Land Area about 56 million square miles; Areas of Deserts (see above) about 22 million square miles; leaving an area of about 34 million square miles, of which about half, or nearly 17 million square miles, is cultivable land.

Thus only some 30 per cent. of the total land area of the world can be regarded as cultivable land capable of producing the ordinary crops of agriculture. So far as the data go this appears to be a rather high estimate, and even with the addition of those small areas in the dry deserts which may be cultivated by the aid of irrigation—probably not more than 2 per cent. to 5 per cent. of the total area of desert—the world's proportion of cultivable land is approximately 30 per cent. And we may conclude by summing up the land area of the world as consisting of 40 per cent. desert; 30 per cent. cultivable land; and 30 per cent. poor grazing land, forest, marsh, waste, and high mountain.

CONSERVATION OF NATIVE TRIBES IN NEW GUINEA

E. W. CHINNERY

THE native population of that part of New Guinea now being administered by Australia under mandate from the League of Nations is believed to exceed half a million. Over 117,000 of these people have been visited by Government officials, and new tribes are coming under control every year. For the purpose of administration the territory is divided into eight districts, each in charge of a District Officer and staff, which includes European officers of armed constabulary and a number of native constables recruited in various parts of the territory. The natives are known as Papuasians and are divided into two main linguistic groups—those who speak Austronesian languages and show Micronesian, Polynesian, and Melanesian influences, and those who speak languages known as Papuan.

Generally, the Papuan-speaking peoples occupy the interior, but here and there their settlements occur also on the coast. For the most part however the coastal regions and the small islands forming part of the territory are occupied by Austronesian-speaking peoples, though in places like the Morobe district, Melanesian thrusts extend inland for some distance, especially on the Markham river, where they may be found 100 miles inland. Micronesian influences are seen amongst the people of the smaller islands lying nearest to the Equator, while Polynesian influences are found on the Feads, Mortlock, and Tasman islands, north and north-east of Bougainville.

The natives present great differences in type, language, and culture. They are scattered among mountains, jungles, and swamps, rivers and coast. With the exception of swamp dwellers in certain coastal regions where there is no fertile land the natives of New Guinea live on taro, sweet potatoes, yams, bananas, sugar cane, and other native foods which they plant in gardens near their habitations, choosing a new site for each garden. The instructors of the Agricultural Department are now teaching them intensive cultivation to enable

them to use the same piece of ground time after time, thus saving endless movements in search of virgin ground which increase the hardships of women and children and dislocate village life.

The swamp dwellers live chiefly on sago, which grows abundantly, but they also secure a fair amount of root food from bush neighbours for which they exchange sago and fish. In addition to vegetable foods bush and coastal people hunt and trap wild pig, cassowary, and in fact practically everything that has life, and in most places fish can be procured.

Before being brought under control the natives live in a state of intertribal warfare, and have practices such as cannibalism, head-hunting, infanticide, immolation of widows, etc. These have to be modified before the people can proceed along the lines of European development, partly because of the loss of life involved by these constant killings and retaliations, which added to deaths from other causes are a drain on the community probably in most places not counterbalanced by the birth rate, and partly because it is not possible to lead into avenues of peaceful progress natives who live in continual fear of being pounced upon by enemies. The Government realizes the relation of these practices to native social and religious life, and it is endeavouring to introduce Western standards in such a way that useful institutions shall be damaged as little as possible; or, in other words, it aims at purifying native institutions instead of suppressing them. In order to facilitate this policy therefore, the Government of the Territory has established a system of training cadets of its district administration staff in anthropology. These young men, chosen in the first place for educational and general capabilities, spend two years on the out-stations under the supervision of an experienced District Officer, and then, having proved themselves likely to be successful officials, are attached for a year to the School of Anthropology, Sydney University, where they receive training in anthropology, the elements of tropical hygiene, surveying, etc., and then return to the Territory to take up positions as patrol officers, where they will be in contact with the natives but still for some years under supervision, until they merit promotion to the rank of of Assistant District Officer.

In opening new country the Government pursues a policy of intensive penetration. Each District Officer endeavours peacefully to bring the unknown portions of his territory gradually under control, small areas at a time. These are extended according to the facilities he has for consolidating the influences of control. It is slow and inconspicuous work, but as it is followed by intensive administration and medical supervision and control it is, in the circumstances, the most effective way of developing new territory.

The health of the native community is one of the first considerations of Government. In New Guinea an elaborate medical organization has been established throughout the whole territory. Each administrative district has its European medical officers and native hospital, and nearly every village under control has a native medical orderly who has been trained in district headquarters in simple treatment. The European medical staff regularly patrols the villages of its district, mapping out morbidity, treating cases that can be relieved on the spot, and bringing into the headquarters hospital those requiring prolonged treatment. Both the native administrative staff and the village

medical orderlies are obliged to send word as quickly as possible to headquarters of the outbreak of epidemics, which are then taken in hand.

Generally speaking the natives in their village surroundings appear to be robust and healthy, but medical investigators have found a large proportion of them to be infected with malaria, and many thousands have been treated for yaws, hookworm, and other tropical diseases. The conditions of life, harder in some districts than in others, fall heavily on women, with the result that high infant mortality is fairly widespread. However, the Government is now endeavouring by means of its scientifically trained officers to investigate questions of population, with the object of laying down a special programme for dealing with conditions affecting the increase of population. As a result of investigations in some of the outlying islands, skilled officers are engaged in training natives to cultivate suitable food plants required to make up deficiencies in native diet. In other places where natives were suffering from land shortage through the land policy in force prior to Australian administration, additional land has been purchased by the administration for the groups requiring it. In the Mortlocks group, the whole population has been repatriated from the employ of the European owners of the group (on whom they were entirely dependent), and settled on Taku, the largest of the Mortlock islands, which the Government purchased from the owners in order to give the native population an opportunity of developing on its own lines. This experiment is proving one of the most interesting that the Government has in hand. The descendants of the old chiefly classes have been appointed Government representatives, and there are one or two old men still alive to instruct the younger generations in the culture of their forefathers.

In these and in other ways, the New Guinea administration is making every effort to develop its native races without unnecessary damage to the very elaborate institutions which form part of native life, in the hope of fulfilling the trust imposed upon it by the League of Nations to advance the moral and material welfare of the people in its charge.

The President invited Professor Dr. Krebs, a Delegate of the Gesellschaft für Erdkunde, Berlin, to speak on the population problem generally:

Professor NORBERT KREBS: I can only congratulate my British colleagues, and urge them to go on with such a great and important problem as population pressure and questions about the habitable globe. I think also that here in England the possibilities are better than elsewhere to push forward these problems. We have now some first investigations and a first view of how many people our Earth may bear with full settlement and the use of all up-to-date methods. I remember my master Penck's studies about the "Bonitierung der Erdoberfläche." What we now want is penetration into the details. You are able to go to countries of different climates and to study the conditions of life there and you know also from your own manufacturing country that the natural conditions do not give at all the whole explanation of the problem, that social conditions are often more important, and that they give at least corrections which we should not neglect.

So hat z.B. der erste Herr Redner mit Recht darauf hingewiesen, dass Raum

genug noch zur Besiedlung vorhanden ist, dass aber viele überseeische Länder heute den Willen nicht besitzen, neue Kolonisten anzusetzen und dadurch den Lebensstandard bei sich selbst zu verschlechtern. Er wird aber andererseits und zwar gerade bei uns in Mittel- und West-Europa zwangsläufig verschlechtert durch "Unterwanderungen," die kaum als Einwanderungen zu bezeichnen sind und oft auch in den Statistiken nicht voll erfasst werden. Ich denke da an die temporären Arbeiterzuwanderungen aus dem Osten und Südosten Europas, die z.B. in hohem Masse gegenwärtig das Besiedlungsproblem Frankreichs charakterisieren. Es handelt sich dabei um Massen, die grösser sind als die grössten Völkerwanderungen vergangener Zeiten.

Unter den physischen Grundlagen interessiert mich persönlich neben den von Kollegen Fawcett erörterten Fragen der trockenen und kalten Räume die Besiedelbarkeit der feuchten Tropen, die sehr grosse Gebiete der Erde ausmachen und bei ihrer potentiellen Fruchtbarkeit für Endergebnis stark ins Gewicht fallen. Aber der schlechte Gesundheitszustand dieser Länder, ihre zu grosse Feuchtigkeit und die doch auch hier stark variierende Bodengüte scheinen Schätzungen auf eine recht unsichere Basis zu stellen. Ich glaube, dass Pencks Zahlen für die inneren Tropen zu hoch gegriffen sind, dass hingegen in den äusseren Tropen mit ihrer einmaligen längeren Trockenzeit schon in der nächsten Zukunft eine grössere Besiedlung erreicht werden kann. Leider fehlt mir für diese Gebiete die eigene Anschauung, die Sie sich hier in England leichter verschaffen können als das uns Deutschen heute möglich ist.

The PRESIDENT: All present will remember that in the original programme for this series of lectures we had indication of a paper from Professor Jean Brunhes. Alas, he died before our Centenary meeting, and we tender to his compatriots our very deep sympathy in the loss of a distinguished geographer.

I am sure we all wish to thank the distinguished speakers to whom we have listened this morning. We thank Professor Carr-Saunders, Professor Fawcett, Mr. Chinnery, and Professor Krebs very much indeed for contributing such valuable information to our proceedings, and also Mr. Eldon Rutter, Mr. Kanthack, and Professor Griffith Taylor for sending papers for inclusion, though they were not able to be present to read them.* I hope when all the papers are bound we shall find we have assembled some contribution of real value to the study of that very important question of the Habitability of the Globe.

THE HABITABILITY OF THE ARABIAN DESERT

ELDON RUTTER

THE Arabian Desert is a waste of naked yellow plains, composed of limestone, gravel flats, or shifting sand, among which are certain volcanic tracts covered with the black debris of lava and basalt. The horizons of this great wilderness are as unbroken as the horizons of the open sea. Like them,

*Professor Griffith Taylor's paper required such extensive illustration that we were not able to include it in the present number.—ED. *G.J.*

they are pierced by infrequent pinnacles of rock. These stand up like huge bared fangs, symbolizing the eternal hunger which obtains in this sterile country.

In a very few places in Central and Northern Arabia, and also in the highlands of the South, small springs of running water issue from the rock. Wherever a spring occurs, an oasis and a human settlement is found. The springs eventually lose themselves in the palm-groves of the oases, or in the desert beyond. In the whole country there is not a single river or stream which reaches the sea, if we except the sudden torrents of rain-water which flow for a few hours or days during the rainy season.

In addition to the springs there are wells dotted about the desert at great distances apart. In some few spots, where a great subterranean store of water exists, a number of wells have been sunk in a small area. In such places oases have been formed, where the soil is suitable for cultivation. But for the most part the wells stand isolated and very far apart in the barren desert. They have been constructed at various times by the Badawi Arabs, who use them to water their herds of camels, and to get drinking-water for themselves.

There is another, though not a perennial, source of water-supply upon which the Arabs rely, namely, pools of rain-water, called, in the singular, *khabra*, plural, *khabari*. These form in wide shallow hollows in the limestone plain, especially in the steppe called El Hamad, in the Rualla territory in Northern Arabia. They may be found at any time between the beginning of November and the end of April, but not every khabra has water in it every year. It depends on whether rain does or does not happen to fall in the area which drains into the khabra.

Apart from the palm-groves and the fruit and vegetable gardens of the insignificant oases, what vegetation is to be found in this great sun-stricken wilderness? The only tree is a stunted thorny acacia which rarely becomes large enough to be accounted anything more than a bush. In the coastal plains, where the infiltration of water from the sea keeps the sub-soil moist, the tamarisk is occasionally met with. Grasses of various sorts, however, are found growing sparsely almost everywhere. Some of these resemble heather in form, but are of a grey-green colour. One variety, which springs up among the sand-dunes of the Nafud when the rains begin, is like meadow-grass. Some of the other varieties can best be compared to barbed wire.

The inhabitants of this desolate country, the Arabs, are divided into two classes—the townsmen or oasis-dwellers, and the Badawin or desert-dwellers. It is the latter class and their wildernesses with which we have to deal. The Badawin care very little for what we regard as comfort. It is so utterly impossible to make oneself comfortable in their terrible country that they have never made any attempt to cultivate ease. A sufficiency of water and pasturage for his camels, coarse tobacco, black coffee, and several young wives, unclean but sportive, with their hair well soaked in camel urine, would be luxuries enough for the most exacting Badawi. They have a saying that they are perfectly happy if they can find a place to camp in where there is plenty of water, pasture, and brushwood for fuel. But there is another thing without which the Badawi is never contented for long—namely, sport. Their national sport is known as *el ghazu*. It consists of making raids on hostile tribes for the purpose of stealing their flocks and herds.

The Badawi's house is his hair-cloth tent. He pitches this wherever he comes across a patch of good pasturage. It is so made that he can open it into the wind or the sun, or close it against them. It is not such a good protection against the sun and rain as, say, an oak tree is. But it is a sheer luxury in that bare country of dire poverty, as any one who has ever crawled into one out of the burning sunlight will know. When the Badawi travels alone on some solitary errand he never takes a tent with him. He ties the leg of his camel and lies down to sleep under the stars.

To the Badawi the empty desert is as full of interest as the English countryside is to ourselves. He rides hither and thither in it all his life, searching among the hot stones for pasturage for his camels. He has a name for every mound and depression, for every dry watercourse and featureless plain, in the wide wilderness. As he rides, whether by day or by night, he is ever on the look-out for things of interest. Where the unaccustomed eyes of a stranger see only an empty plain, as lifeless as the sky overhead, the Badawi sees and studies, probably, an encampment of Arabs among some rocks 20 miles away, a flock of vultures tearing up the carcase of a camel, or a sand-coloured snake wriggling under a thorn-bush. He reads the ground as an European reads his newspaper. From the tracks he sees there, he knows whether the camels which passed that way were pack-camels or riding-camels, whether they were loaded or marching without burdens, what their pace was, whether they were grazing as they went, how long it is since they passed by, where they were going, and where they had come from. With the help of all this information, added to his general knowledge of desert politics and the movements of tribes, he knows to what tribe these camels belonged and, consequently, whether they were friends or foes.

It is on the upland plains of Northern and Central Arabia that the best camels are bred. Neither the soft fat beasts of the Nile Valley nor the tall giants of Sind are to be compared for general utility with the camels bred in the Arabian deserts. Constant wandering in the heat of summer and the cold winds of winter gives to the Arabian camel a degree of hardiness and power of endurance which is possessed by no other breed. In the spring, after the rains have fallen, young grass springs up everywhere. At this time the camels eat their fill day after day, and become fat, their humps rising nearly 2 feet above the spine. A camel in this condition will sell for £15 to £18 to the butchers in Egypt. The Egyptians consume a great deal of camel meat. The best riding-camels are sold to the army in Syria and Palestine, where they often fetch £20 or even more.

The tribes of Northern Arabia possess, besides camels, large flocks of goats and sheep. In the heat of summer these are left with shepherds near the oases on the borders of Syria and 'Iraq, where the Badawin are sure of getting sufficient water for them. But soon after the rains have begun to fall the flocks are driven into the desert, where they live for four or five months on the spring pasturage. They are driven slowly from water to water, and learn to go without drinking for as long as four days in the cold weather. These sheep and goats are small, but they are excellent as food, and their short fleeces are used to line the skin coats which the Badawin wear in the frosty days and nights of winter.

The Northern tribes also breed a considerable number of horses. A Badawi

values his horse above everything else. If there is a shortage of water he will pour out a drink from the goat-skin water-bag, first for his horse, and then for himself and his family. Often they give their horses camel milk to drink. When they are travelling over a country where there is no pasture they feed the horses with barley which they carry with them, or if they have no barley, they will give them some of the dough which they prepare to make bread with.

When he goes out with a raiding-party the Badawi mounts into the saddle of his camel, while a son or other kinsman mounts behind him on the animal's croup. The horse is led by its long single rein of hair-rope. When they come up with the enemy the raiders get off their camels and mount their horses. The young boys are left in charge of the camels until they are summoned to reinforce the attacking party or the latter returns with the spoil.

The unproductive nature of the desert has caused the habits and daily life of the Badawin to remain the same as they have been probably for thousands of years. With the exception of firearms, Manchester cotton cloth, coffee, and tobacco, the Badawin possess nothing at this day which they did not possess before the time of Muhammad. Their tribal customs have not been seriously modified by Islam. In fact, by prowling along the roads leading to Mecca, and obstructing the pilgrim caravans, they have exposed themselves to the charge, which is frequently laid against them by the townsmen, of being enemies of Allah.

The Badawi can never remain long in the same place. His camels quickly eat up the sparse herbage, and then he must drive them to new grazing-grounds. Many of the grazing-grounds have no wells for hundreds of miles. Consequently they can only be made use of in the rainy season. Towards the end of October the Badawin begin anxiously to search the sky for rain-clouds. A few flashes of lightning will bring scouts riding over the barren plain from all directions to search for rain-pools.

The Arab's chief business in life is to breed camels. Even the indulgence of his favourite pastime, the raid, makes this a necessity. Now the camel is an unfortunate beast, for which nobody who does not intend to travel in barren countries has any use. Without his peculiar qualities of hardihood and the power to endure on short rations, the camel would be of less use in the desert than the horse. He must therefore be bred in circumstances of hardship in order that he may retain his distinctive qualities. The hard conditions of existence in Arabia suit the camel, and the coarse vegetation of the desert is its natural food. Camels fed on *birsim* may be fatter, but they never have anything like the same degree of strength and endurance as those fed on the *rutha* and *hamdh* of the desert.

As camel-breeders, then, the Badawin could not have a better country than that which they inhabit. As for the necessaries of life: their saddle-bags, bridles, sacks, ropes, and other gear are made by the women from the hair of their camels. When he wants coffee, flour, dates, or any other of the simple things needed in the desert, the Badawi sells a camel in an oasis and buys what he wants there with the proceeds. This is the Arabian Desert to-day, and such it has probably been since the days of Abraham.

THE ALLEGED DESICCATION OF SOUTH AFRICA

F. E. KANTHACK, C.M.G., M.INST.C.E., M.INST.MECH.E.

FOR the past thirty years it has been a common cry in South Africa that the country is drying up, and there is much loose talk about the diminution in the rainfall and the change in the character of the precipitation. These popular outbursts naturally become more intense during periods of serious drought, which are, unfortunately, of frequent occurrence in certain portions of South Africa. There is another aspect of the question which periodically excites both public and official imagination, namely, the erosion of the soil and softer rocks of the country which has been proceeding on an enormous scale during the past hundred years. So far as the general public and especially the farmers are concerned, the two factors are generally linked together, and devastation of large areas due to soil erosion is attributed to meteorological changes during the past century.

In dealing with these problems it is first necessary to define what is meant by the term "desiccation" and to limit the area under consideration. For the purpose of this paper desiccation will be held to mean the deterioration of the country within historic times due to altered meteorological conditions or to erosion, thereby reducing its capacity to support human life. On the basis of the above definition the areas affected in South Africa are, in the main, confined to that section of the country having a mean annual rainfall below 20 inches. This area includes the greater part of the Cape and the western half of the Orange Free State Provinces of the Union of South Africa.

The agencies at work producing desiccation are certainly in operation in portions of the Transvaal and Natal in the Union, and the south-western portion of Southern Rhodesia; but their effect is, so far, much less marked. Deterioration of the country is to be seen at its worst in the semi-arid sections of the country, in which are included the Karroo of the Cape Province, lying between the main coastal mountains on the south and the Orange River on the north, and between the Atlantic Ocean on the west and approximately longitude 27° E. on the east. The whole of this area is on the plateau and the greater part of it is composed of the soft shales and sandstones of the Karroo geological formation. The western Free State is likewise composed of the same rocks, but the country is exceedingly flat and the rainfall is better and subject to less violent fluctuations. In treating this subject, observations will be mainly confined to the areas described above.

Erosion is certainly proceeding on a big scale in Northern Natal, where the soft rocks of Karroo age forming the eastern escarpment of the Drakensberg range are readily exposed to the destructive agencies of the alternating wet and dry seasons. But in the arid and semi-arid country between the Atlantic Ocean and the Transvaal border, lying to the north of the Orange River, there is no evidence that conditions have materially changed since the advent of the white man in South Africa.

The whole question of desiccation in South Africa has in recent years been exhaustively dealt with officially by the Drought Investigation Commission, which was appointed by H.E. the Governor-General in the Union of South

Africa in November 1920, and which published its voluminous report during 1923 (Blue Book U.G. 49, 1923). The Commissioners, after reviewing all evidence tendered, and all reliable literature and reports available at the time, summarized the position in so far as the stability of climate is concerned, as follows: (1) No proof was submitted that the mean annual rainfall of the Union has altered appreciably within recent historic times; nor is it considered likely that such a change has taken place. (2) No data were submitted either supporting or rebutting the statement of many witnesses that there has been a change in the nature of the rainfall within the last few decades. There is also nothing to show that such a change, if it exists, is permanent.

The above summary is a cautious statement of the case, and after years of study of rainfall returns in the Union the author is convinced that a Commission could come to no other conclusion. The best evidence available for the stability of the climate in the drier parts of South Africa can be drawn from the silent testimony of the plant life and from the geological conditions as we now find them and as travellers recorded them over a century ago.

We need not here concern ourselves with great climatic changes which occurred in the Southern Hemisphere in pre-Tertiary times. Fluctuations have no doubt occurred in later times, but geological and botanical evidence all points to the continued aridity of the greater part of the Karroo and of the West Coast from north of Cape Town to Benguella. Such recent changes in the vegetation as have taken place in Southern Africa have been due entirely to the action of the white man and not to fundamental changes in conditions governing meteorology and climate.

Professor Schwarz assumed that the desert conditions of the Karroo were of comparatively recent origin. This is clearly contradicted by the botanical evidence. The typical Karroo flora is of a highly specialized type. All organs, such as the leaves, stems, and roots, are either for the purpose of storing moisture or for the prevention of transpiration. This high degree of specialization has clearly been evolved in the course of a very long period of time. It is a well-known fact also that the Karroo succulents are the most difficult of all plants to grow out of their natural habitat, and cannot easily be acclimatized artificially, as is the case with many other of the wild veld plants.

Veld flooding which stimulates the growth of sweet grasses rapidly exterminates the Karroo succulents; and in the zone on the eastern margin of the dry area, where the mean annual rainfall ranges from 15 to 20 inches, a series of good rainfall years will establish grass-veld conditions, whereas two or three poor years will re-establish the Karroo bushes. In the southern-western Free State the rainfall conditions favour the establishment of mixed veld, *i.e.* grasses and Karroo bushes. Within certain limits there are changes in the boundaries of the Karroo and grass veld due to temporary climatic variations, but these intermediate zones are comparatively narrow.

Topographical conditions likewise affect the plant distribution. The typical extensive alluvial flats which were a feature of most of the wide valleys in the Karroo in the earlier days of the white occupation, were subject to periodical flooding. The general absence of defined watercourses caused the surface drainage to spread out in thin films over wide areas, thus producing a natural flood irrigation system. Under such conditions the grasses crowded out the

Karroo succulents and other bushes which were confined to the shallow soils of the valley sides and to the hills.

The geological evidence is equally positive in favour of a very lengthy period of aridity in the Karroo and along the West Coast. The troughs of the larger Karroo rivers, which were carved out in, it is believed, Tertiary times became entirely filled up with very fine silt, largely wind borne, and a very long period of such warping ensued, forming the extensive flats referred to above. The rejuvenation of the Karroo drainage system is of very recent origin and, as will be shown later, is due to artificial causes. Geological researches in Namaqualand and elsewhere in the arid regions have clearly proved the existence of immense thicknesses of deposits formed by erosion under extreme arid conditions.

The existence of the cold antarctic current which hugs the west coast of South Africa for a distance of about 1200 miles north of Cape Town gives rise to extreme arid conditions all along this coast, and must have done so for an immense period of time. Finally the historical evidence available during the past two centuries as found in the works recording the travels of Lichenstein and others goes to show that the Karroo was cursed with severe droughts in those early days. It must also be borne in mind that the word "Karroo" is Bushman or Hottentot in origin and implies aridity.

So far as rainfall and its distribution and mode of occurrence are concerned, it must always be remembered that South African records cover only a comparatively short period of time. The longest continuous record is that of the Royal Observatory in Cape Town, dating from 1841, but on the plateau in the Cape Province there are very few records extending farther back than fifty years. Direct evidence regarding changes in rainfall is therefore somewhat sketchy. So far as they go the rainfall records provide no evidence in favour of any permanent change in climate. Accepting this as a fact, the great changes in the surface conditions in the drier parts of the country, both physical and biological, and the general deterioration of this section of the country in regard to its capacity to support human life remains to be explained. The flower gardens and herds of game of which Professor Schwarz spoke and which he desired to recreate by effecting a change in the climate, undoubtedly existed a century ago, and all the available evidence goes to show that these existed under climatic conditions identical with those of to-day. The causes of this deterioration will now be briefly discussed.

The deterioration is brought about by soil erosion and, in the words of the Drought Commission, "Soil erosion is caused mainly by deterioration of the vegetal cover, brought about by incorrect veld management." The above quotation puts the whole trouble in a nutshell. Faulty farming is and has been by far the greatest source of the evil. In a lesser degree faulty road alignment and construction and faulty railway construction have both been contributory causes.

So far as veld management is concerned, the chief offender has, from the earliest days of settlement, been the pastoral farmer. The country was, generations ago, divided into large farms, most of which ranged from 8000 to 50,000 acres in extent. In the early days fences were unknown and farm and camp boundaries, if demarcated at all, were divided off by means of dry stone

walls, the best and most lasting of which were built with slave labour. In those days the country was overrun with jackals, wild dogs, leopards, wild cats, and other carnivora. As these animals played havoc with the small stock—the sheep and goats—the practice of driving all the animals each evening into walled enclosures or kraals close to the homesteads became universal, and amongst the majority of the smaller farmers the practice persists to-day.

Among the enlightened and wealthier sheep farmers the practice has been discontinued, but mainly for the reason that they discovered that such treatment was unnatural and bad for the flocks, and that the system of running sheep day and night in suitable vermin-proof paddocks greatly enhanced the value of the flocks, conserved the pastures, and led to an enormous reduction in drought losses.

The bad effect of kraaling very soon made itself felt. The constant useless tramping of the sheep loosened the soil, destroyed much of the bush, and created innumerable little paths. During the hot and dry periods much of the soil covering, reduced to dust, was blown away. When the rain came the surface became scored by small watercourses and a defined river system was formed where previously the surface drainage had merely spread in a thin film over the face of the country and irrigated it.

The magnificent grass flats or vleis as they are called which were a common feature even in recent times are now practically non-existent. They are gashed in every direction by deep ravines or "sloots" all converging on to the main drainage lines of the country, which are now occupied by wide and deep channels. The moisture having all drained out of the soil, the grasses have disappeared and the surface is either bare and encrusted with alkali salts, chiefly sodium sulphate, carbonate, and chloride, or at best supports a low-grade scrub of little or no food value.

A very typical case may be cited as an example. In the Britstown district of the Cape Province there are a series of farms along the drainage line of what is now the Ongers or Brak River. In the 1860's there was nothing in the nature of a visible river. The drainage line was marked by isolated pools in which hippo were to be found. On either side of the drainage line were thousands of acres of flat deep alluvium over which the surface water spread in times of rain, reaching in some places to points 2 and 3 miles away from the true drainage line. These flats were clothed with dense sweet grass and supported thousands of head of game. The boulders on some of the dolerite kopjes overlooking these flats bear hundreds of chippings by the bushmen depicting the various species of game. In the sixties of last century the country was a choice hunting ground for white men who have not long since passed away. The author first saw this area in 1907. The Ongers River running through these famous flats formed a gash in the country approximately 300 feet wide and 20 feet deep, containing at intervals pools of "brak" saturated water, the bed being otherwise covered with alkali efflorescence. The famous flats on either bank were barren wildernesses intersected with ravines. These flats have since been reclaimed and brought under irrigation from a large storage reservoir and canal system which were built at great expense, but it is doubtful whether the land to-day under irrigation is worth much more than would have been the case had it been maintained in its original state.

What has been described above is repeated hundreds of times over throughout the Karroo, and the cause is invariably the same: the driving of large flocks of sheep nightly to the kraals at distant homesteads. It is disturbing to note the speed at which valuable land will deteriorate, and by way of illustration an example may be cited from another district in the Cape Midlands. The farm in question was very typical of hundreds of others in the Karroo. A large vlei some thousands of acres in extent was closed at its lower end by the usual short gorge or "poort" in the encircling chain of dolerite kopjes. The vlei formed of deep rich alluvial soil carried heavy crops of sweet grasses. Above the closing gorge strong springs emerged yielding a steady supply of water. The War Office purchased this farm for a cavalry cantonment after the Boer War and, apart from tramping out the vlei, constructed certain works at the entrance to the gorge which tended to concentrate the surface drainage.

About five years later the farm was well on its way to being ruined. A channel had developed through the gorge from 50 to 100 feet wide and 15 to 20 feet deep. The springs had disappeared, and the water was draining away into the deep channel, and the vlei was cut up into a network of ravines. As the farm had been purchased from the Imperial Government for the establishment of an agricultural college, reclamation works were started, but the expenditure of many thousands of pounds only beneficially affected a comparatively small portion of the vlei.

Apart from "kraaling" of sheep, overstocking has likewise been a fertile source of trouble, leading to the destruction of the vegetal covering and to subsequent erosion. Veld erosion can in its very early stages be checked and good land can be reclaimed by the stopping of small rivulets by means of bush and stone, and by improved methods of pastoral farming, but the process very soon gets out of control, and reclamation becomes prohibitively costly. In the grass areas, veld burning has been almost equally destructive in causing erosion, and the practice tends to destroy the better species of grass and to stimulate the growth of coarser and sour species.

So-called roads have wrought terrible havoc. They were in former times mere veld tracks devoid of any drainage and rapidly developed into ravines. No attempt was made to repair them. A fresh track was made alongside the old one so that in course of time long sloping hillsides became a mass of ravines.

Fires and the goat grazier have wrought incalculable damage along the marginal mountain ranges in the Cape Province, causing complete denudation of large areas. The effect of this has been very bad. Mountain streams formerly perennial and giving steady supplies of water for irrigation in the rich valleys to the south and west are now converted into mountain torrents generally dry and running only for short periods after rain in the mountains. During heavy rains these torrents bring down enormous volumes of sand, boulders, and other useless detritus. The rich alluvial soil in the valleys below is carried away and barren material deposited in its place. Within the author's own experience during the past twenty-five years large areas of immensely rich alluvial soil in the Oudtshoorn valley—famous for its fertility—have been carried away to the sea by devastating floods with nothing but coarse silica sand and boulders to replace it.

The same has happened in other rich valleys, such as the Gamtoos and the

Great Fish. Examples of deterioration and absolute destruction could be cited without number, but enough has been said to show that the so-called desiccation now in progress with its appalling drought losses is due entirely to the misguided actions of the white man since he settled in the drier parts of South Africa. The Drought Commission so frequently referred to above strongly stresses this result of its investigations, and could not possibly have come to any other conclusions, which were fully realized by investigators years before. Their only suggested remedy for the repeated appalling drought losses is the introduction of enlightened pastoral farming methods.

The trouble is that soil erosion once started tends to increase at an ever-growing rate. The greater the erosion the more intense the run-off and the more devastating the floods. We have in South Africa on several occasions had to witness the apparent paradox of Parliament having to vote large sums of money for relief of distress due to floods, whilst it was actually engaged in passing measures for the relief of drought-stricken farmers in practically the same area.

A vast tonnage of excellent soil has during the past century been sent down to the ocean to swell the dimensions of the great Agulhas bank and is, of course, irretrievably lost, and it would take thousands of years to make good the damage by natural means if all further erosion were stopped. Much can however be done to check the rate of destruction. The better type of farmer—pastoral or agricultural—has been doing excellent work for many years, and he is well aware that conservation of the veld and of his valuable alluvial soils is a paying proposition and that failure to do so means bankruptcy. The arid and semi-arid back-veld is however still mainly inhabited by ignorant, poverty stricken, and indolent people who are difficult to educate, unwilling to learn, incapable of carrying out improvements because of their poverty, and often very work-shy. There is at the moment a recrudescence of official concern about the alarming effects of soil erosion following seven years of indifference and inactivity since the Drought Commission report was published, and it is to be hoped that something tangible will result.

INCIDENTS IN THE HISTORY OF EXPLORATION

When Delegates and Fellows reassembled in the Society's Hall on the afternoon of Thursday October 23,

The PRESIDENT said: This afternoon we are to have the privilege of listening to a series of short addresses by British explorers on special incidents in the history of exploration; but before I ask any of them to begin their addresses I should like to show two map-slides, one of the Old World and one of the New, which will indicate how much interest the Royal Geographical Society has always taken in its fundamental duty of exploring the Earth's surface. You will see marked the places of these various expeditions which have either been partly financed by the Society or been helped in other ways, such as by the loan or gift of instruments. In the Old World, at any rate, you will see those expeditions scattered over the whole hemisphere.

The President then called upon Sir Francis Younghusband, Lord Lugard, Sir Martin Conway, Sir Halford Mackinder, and Mr. Wordie in this order.

THE MUZTAGH PASS IN 1887

LIEUT.-COL. SIR FRANCIS YOUNGHUSBAND, K.C.S.I., K.C.I.E.

THE Muztagh Pass is a pass across the main watershed between India and Central Asia. On the one side the glaciers at its base flow down towards India, and the water from them eventually reaches the Indus and flows into the Arabian Sea; and on the other they flow into the Yarkand River and eventually lose themselves in the sands of the Gobi Desert. It also stands in a position almost on the direct line between Yarkand (the starting-point of the caravans which make for India from Central Asia) and Srinagar in Kashmir, the point of their arrival. But the caravans instead of using the Muztagh Pass have for centuries—perhaps thousands of years—made use of the more circuitous route by the Karakoram Pass to the east.

Why have they done this? Why have they not used the more direct pass? For long it had been known that some people used the Muztagh Pass. It was marked on old maps, and old travellers mentioned it. Was it still used, and of what value was it for trading purposes—and therefore for military purposes? These were the questions I was asked to answer in 1887. I had then just arrived in Yarkand on a journey from Peking to India. I had been preceded a month before by Colonel Mark Bell, the then head of the Intelligence Department in India. He had to travel by the usual caravan route over the Karakoram Pass, as he had heard there was too much water at that season—August—in the rivers on the way to the Muztagh Pass. But he asked me to try the Muztagh Pass.

This was an enterprise well after my own heart. But I had had no experience of mountaineering, and had no Alpine equipment—not even a pair of nailed boots, still less an ice-axe. And I had no money. I had already travelled nearly 3000 miles across the Desert of Gobi and the plains of Turkistan. And now I was asked to cross the Himalaya by an unknown pass. It was just the kind of call I liked. Inexperienced though I was I had the advantage of youth, and Asiatics love to follow a young man. They like to take charge of him, yet feel that he is there to lead them when the crisis comes. Colonel Bell had sent back to help me an ideal caravan leader—Muhammad Isa—who, seventeen years later, accompanied me to Lhasa and afterwards died with Sven Hedin in Tibet. Indian merchants in Yarkand confidingly lent me money on the security of a note from me to a banker in Kashmir. They and Muhammad Isa got together a number of ponies and the necessary supplies and, most important of all, got a man named Wali, who had crossed the pass twenty-five years before, to act as a guide. Since then the pass had fallen into disuse, but Wali was confident he could find the way.

So on 8 September 1887 with eight men and thirteen ponies I left Yarkand. Except the Chinese servant, Liusan, who had come the whole way from Peking with me, all the men were from the Indian side of the Himalaya and three had

been captured by those Hunza raiders who then used to infest the trade route and against whom we had to be on our guard. After crossing the Aghil range and the Shaksgam river, both of which were hitherto unknown, we came to the glacier which descends from the Muztagh Pass. I had never seen a glacier before and was amazed at the sight of this great river of solid ice a couple of hundred feet thick filling the valley-bottom. How we ascended this glacier and eventually crossed the pass I will now describe by quoting from the letter I wrote to my father on my arrival at Skardu on the Kashmir side. I wrote:

"Since my guide had crossed, an immense glacier had descended completely blocking up the valley with ice and immense boulders. Over this for three days I dragged my horses. Twice I gave it up and ordered the horses to go round by Ladakh while I went on with a few men; and twice I renewed the struggle till I got them on to the smooth snow on the high part of the mountain. It was terribly hard work. All day long from daybreak till after dark I was on my legs, first exploring ahead, then returning and bringing on the party; and at the great elevation I was, as one gets, very exhausted—and at night I lay on the ground in the open very warmly wrapped up in sheepskin, as the Kanjuti (Hunza) robbers are said to have a nasty habit of letting the tent down on top of you when you are asleep at night inside.

"On the third day of the ascent proper I sent two men on ahead to report on the pass. They returned at night to say that the pass which used to be practical for horses was now quite impassable through ice having collected, and that the only thing now was to go by the other pass (there are two separate passes—the real Muztagh Pass, and another, 10 miles distant, which is the one that had been practicable for horses) and bring back a number of men from the upper valleys of the district to make a road for the horses.

"So on the next day, September 28, I set out to explore the pass, leaving three men with the horses and baggage. This pass is over the main axis of the Himalaya . . . so we might expect something of a pass, and it is one of the highest and most difficult in the Himalaya. The ascent was easy enough over smooth snow, but we went very slowly on account of the difficulty of breathing. On reaching the summit we looked about for a way down, but there was nothing but a sheer precipice and great blocks of ice broken and tumbled about in such a way as to be quite impracticable. I freely confess that I myself could never have attempted the descent, and that I—an Englishman—was afraid to go first. Luckily my guides were better plucked than myself, and, tying a rope round the leading man's waist, the rest of us hung on to the end while he hewed steps across the ice slope which led down to the precipice.

"Step by step we advanced across it, all the time facing the precipice and knowing that if we slipped—and the ice was very slippery—we should roll down the icy slope and over the precipice into eternity. Halfway across my Ladakhi servant (Muhammad Isa), whom Colonel Bell had sent to me as a man thoroughly acquainted with Himalaya travel, turned back, saying he was trembling all over and could not face the precipice. It rather upset me, seeing a born hill-man, who had travelled in nearly every part of the Himalayas, so affected, but I pretended not to care a bit and laughed it off *pour encourager les autres*, as the thing had to be done. After a time—and a very nasty time it

was—we reached *terra firma* in the shape of a large projecting ledge of rock, and from there began the descent of the precipice.

"The icy slope was a perfect joke to this. We let ourselves down very gradually from any little ledge and projecting piece of rock. On getting some way down I heard my Ladakhi servant appealing to me from above. He had mustered up courage to cross the icy slope and descended the precipice for a few steps, and was now squatting on a rock salaaming profusely to me with both hands and saying he dare not move another step and that he would go back and take my horses round by the Ladakh road. So I sent him back.

"For six hours we descended the precipice, partly rock and partly icy slope, and when I reached the bottom and looked back it seemed utterly impossible that any man could have come down such a place. For several hours after we trudged on in the moonlight over snow with crevasses every 50 yards or so. Often we fell in, but had no accident. At last, late at night, we reached a dry spot, and I spread my rugs behind a rock while one of the men made a small fire of some dry grass and a couple of alpenstocks to cook some tea. After taking some biscuits with the tea I rolled myself up in the sheepskin and slept as soundly as I ever did."

Such is the account I wrote at the time of the crossing of the Muztagh Pass. I should note that we had no ice-axes but only sticks with a metal point at the end, and that I, like all the men, wore only the native boots, which were really leather stockings—good on rocks but most dangerous on ice. Three days after crossing the pass we reached Askole, the first village on the Indian side, and from there sent back supplies to the party left behind. And the latter, including my Chinese servant, eventually reached India by the Karakoram Pass. That these Askole men should have been able to cross and recross the pass was indeed a remarkable performance.

Fifteen years later the Muztagh Pass was climbed by the German, Ferber; and last year the Duke of Spoleto's party crossed it on their way to the Shaksgam Valley. From the photograph which first Ferber and then the Duke of Spoleto brought back it is evident that the ice has been much advancing of recent years. When I crossed it forty-three years ago there was much more ice on it than when it was in use thirty or forty years before. In Ferber's time there was more ice than in mine. And last year there was more ice than in Ferber's time. In old days there was probably quite a feasible way up the ravine to the col. Then ice came down on to the col and flowed over more and more into the ravine.

I had no hesitation in reporting to my chief that it was impracticable for military purposes, which was all I was concerned about. But it obviously is quite a feasible way for properly equipped mountaineering expeditions.

THE FIRST EXPEDITION FROM UGANDA TO MOUNT RUWENZORI

THE RT. HON. LORD LUGARD, G.C.M.G., C.B., D.S.O.

I HAVE been invited to say a few words describing the first expedition from Uganda to Mount Ruwenzori shortly after Stanley had made its existence known to Europe. I must explain what took me in that direction.

In December 1890 I reached Uganda with instructions to conclude a treaty with the Kabaka Mwanga before Dr. Karl Peters, who had started some time previously *via* the Tana river, or Emin Pasha, who had come through German East Africa, should have arrived. The treaty was concluded and signed not without difficulty, but the tension between the Roman Catholic and Protestant parties, or Wa-Iransa and Wa-Ingleza as they called themselves, grew greater and greater. Murders and outrages became more frequent, and it was clear that the country was on the verge of civil war. The Muhammadan faction had been worsted by the Christians and had taken refuge in Unyoro. They were encamped on the frontier from whence they were raiding Uganda with increasing boldness. Hoping to avert civil war between the Christians I persuaded them to unite against the common enemy. If the Christians fell out the Moslems would again become the dominant power in Uganda. After defeating the Moslems I determined to attempt to reach the Sudanese troops who had been abandoned by Stanley at the south end of the Albert Lake and to enlist some of them in order to maintain the peace in Uganda.

Leaving the Waganda Army on 11 May 1891, I marched with about 100 Sudanese and 350 Zanzibari Askari and porters, and a party of Waganda volunteers to Buddu, the south-eastern province of Uganda. Thence we struck westward along the northern frontiers of Ankole, a route not previously explored, making a treaty of friendship with Ntali, the King of Ankole, on the way. Crossing the narrow channel which unites the Lakes Ruisamba and Albert Edward (now renamed Lakes Edward and George) we took possession of the tiny claret-coloured salt lake at Katwe, which was separated from the Great Lake by a narrow causeway on which I built a strong stockade. It was from here that we got our first sudden and unexpected glimpse of the snow peaks of Ruwenzori, tinted a rose-colour by the setting sun, on 15 July 1891.

I had heard that Emin Pasha had left the Wanyamwezi country south of Lake Victoria in German East Africa and was also on his way (with what object I did not know) to the Sudanese Camp, which report said was on the western side of the great mountain mass. Leaving Dr. Mackenzie and the Sudanese soldiers at Katwe, I proceeded with my other British companion, Mr. Grant, in search of the camp. After five days' march we reached it at Miala, but it proved to be the headquarters of a raiding party from the Congo slave traders with whom Stanley had had trouble, and who, though by no means friendly, thought it wiser to keep the peace and presented me with two pygmies, caught, they said, by order of Emin, whose camp I saw. They had them caged like wild animals and I was glad to accept them and to give them their liberty. They had the run of the camp and became favourites with the men.

I returned to Katwe, and picking up the doctor and the Sudanese we set our faces to the north. Marching along the eastern side of Ruwenzori through the hostile country of Unyoro, we were opposed by Kabarega's army which fled after a few long-distance shots from us which I believe caused some casualties. I had only a few rounds of ammunition per man and had to be very careful of its expenditure.

On August 12 I selected a site for a stockade (Fort Edward) on a spur of Ruwenzori called Kabukeru, and at last at early sunrise we got our first full sight of some half-dozen snow-capped peaks above the clouds which, as Stanley says, envelope the summits for three hundred days in the year. There is no need for me to describe the wonderful beauty and majesty of this mountain mass to which Stanley devotes a long chapter in his 'Darkest Africa,' saying that no European would see it again for very many years, since only a powerful army could approach it from the direction of Uganda. The fierce Wara Sura on the east and the raiding Manyema on the west would cut off all access. It happened however that I was camped at its foot not many months after he wrote his description.

Stanley, with the "Emin Pasha Relief Expedition," you will recollect, had first reached Lake Albert from the Congo in December 1887, and he finally left it with Emin Pasha after retracing his steps to search for his rearguard and other delays in April 1889, a year and four months later. When at Lake Albert he had caught glimpses of a lofty mountain, but it was not until he had approached close to it in his march to the east coast that he obtained a full view of the snow-covered peaks. He marched along the western flanks of the mountain, whereas my route was along the eastern side through Unyoro. Our routes crossed in the Kitagwenda country and at Katwe. His forward march to the coast was in a southerly direction through the heart of Ankole and Karagwe to the south of Lake Victoria.

The people of this country, the Watoro, were being killed and carried off as slaves by Kabarega of Unyoro. I restored to them their rightful king, Kasagama, whom I had brought from Uganda, where he had been a refugee from his boyhood, and continued my journey on August 25. Next day we were again opposed by a larger Unyoro army. A few days later we passed the lovely crater lakes of Vijongo and descended a precipitous escarpment of about 1200 feet to the level of the Albert Lake. Shortly afterwards we crossed the Semliki, which was here a broad and deep river. A large army arrived just too late to deliver a night attack upon us before we crossed, but knowing they had the river between themselves and us, they let off a prodigious amount of ammunition at us. I was steering entirely by compass, and we were involved in great difficulties, at one time marching through swamp sometimes waist deep, forcing our way through dense pathless vegetation, and later climbing the steep escarpment of the Kavalli range. Day after day the rearguard under Grant only reached camp at sunset, having started at daylight. Grant was simply splendid. I have never in my varied experience had a more loyal and more indefatigable comrade. The Swahili porters were amazing. The feats of strength and endurance they performed seemed incredible, fighting their way through swamps or up or down cliffs with a 70-lb. load on their heads, and though I was ruthless in punishing thefts from the villages we

passed through, there was no sign of grumbling or discontent. It is in such circumstances that the African is at his best, and he is unsurpassed.

The time at my disposal is exhausted. I may just add that we reached the Sudanese and came to terms of friendship with them. Their loyalty under their veteran leader Selim Bey to their master the Khedive, for whose flag they had fought they said against the Mahdi and Dervishes for fifteen years, was more than touching. Forty years have passed, but I still cannot bear to recall the circumstances which closed his gallant career.

I visited Stanley's camp for a check to my map, and abandoning my thoughts of going on to Wadelai, I brought the whole of the Sudanese with me. As they crossed the Semliki, Grant counted 8200 men, women, and children. We returned by a more easterly route along which at intervals I built five strong forts and garrisoned them with Sudanese to protect the people of Toro from the tyranny of the Wanyoro.

It was November before I once more reached Fort Edward and said good-bye to Ruwenzori. We reached Uganda by Christmas 1891.

THE ANDES IN 1898

SIR MARTIN CONWAY

I HAVE been asked to occupy your attention for a few minutes with some incidents of my exploration, in 1898, of the Central Group of the Cordillera of the Andes. Six years before I had conducted a journey of exploration in the Karakoram Himalaya. From a mountaineering point of view the Andes proved to be very different.

The backbone of South America, where it passes through Peru and Bolivia, consists of two parallel ranges. The coast range is volcanic, the inner range—the true Cordillera of the Andes—is an upheaved ridge of far more ancient rock. Between the two there runs a plateau at an altitude of some 12,000 feet above the sea. It follows that the mountains, even when they rise to a height of 22,000 feet, appear to be of quite moderate elevation as seen from the plateau floor. They are not broken into spires and difficult or impossible ridges like the Karakoram, but in outline and general form they more closely resemble the Alps.

On the east or continental side, the front of the Andes is formed by a great precipice stretching down to about 5000 feet above sea-level at the edge of the Amazon Forest, and rising in one great uplift to altitudes of from 16,000 to 22,000 feet. This face of the Andes is one of the most remarkable precipices in the world. Unfortunately it is seldom visible to people in the inhabited regions below. Though I myself have looked down it and seen it clear to the foot from above, I have only had imperfect visions of it from the other side. It is however easy to imagine how wonderful must be the views, which I have heard described by a few travellers, when this great eastward-fronting cliff is illumined by the rose of dawn before the morning clouds gather about it and completely hide it from view.

The peasant inhabitants of almost all mountain regions picture to themselves

the snowy heights as the abode of spirits, evil or beneficent. The Incas were no exception in this respect. Indeed, they regarded the snowy mountains with more than usual veneration and worshipped them, or rather the gods that dwelt upon them, with elaborate ceremonial. Chief among the venerated peaks were the two highest, Illimani and Illampu. The former is visible from the principal streets in the capital city, La Paz, and has always therefore been very familiar to the inhabitants of that region. Illampu looks down upon the great sacred lake Titicaca, and its striking form and remarkable surroundings attracted the eye and stimulated the veneration of many generations. These two mountains stand as sentinels to north and south of the great range, and between them rise several lofty peaks. I think there is no range of mountains in the world possessing so many native names for individual peaks—a proof of the interest taken in them by the population at their foot.

The superstitions attached to the mountains by the Bolivian Indians are one of the climber's greatest impediments. My own researches were continually interrupted by the disinclination of the people to allow strangers to approach their sacred peaks. I shall not easily forget the raid that was made upon my party by some 250 irate villagers who held me responsible for unusual and undesired rainfall, which damaged their crops, and was, so they believed, the result of my impious invasion of the home of their gods. When I came down from a successful ascent of Illimani, I found the inhabitants of the highest village engaged in a ritual dance, on what I was told was a sacred threshing-floor, for the purpose of appeasing an outraged divinity. The villagers were dancing round and round in a circle, with a piper playing an ever-repeated and rather pathetic refrain. This hostile attitude of an ignorant native population considerably interfered with my exploration, and as the news of my doings spread abroad it became necessary for me to leave the country a month sooner than I had intended.

The outer or volcanic range contains peaks rising to an altitude of 20,000 feet. The most notable of these is Sajama—a perfect volcanic cone—but I made no attempt to ascend it as from bottom to top it appears to be one continual slope of screes, the most monotonous and most laborious kind of ascent provided by any type of mountain. Just such a slope, of almost equal length, awaited me on Aconcagua, the highest mountain in South America, which I ascended on the way home.

The volcanic scenery of the southern parts of Bolivia and the north of Chile—that is to say of the region through which the Antofagasta Railway runs—does not possess the renown which its extraordinary beauty and unusual character would warrant. Here you have a desert as barren as the moon, with dry salt lakes white as though covered with snow; with volcanic rocks, brilliant with all kinds of colours, jutting up in apparent confusion; with lava streams—ejected who knows how long ago?—looking apparently as sharply defined as on the day when first they poured across the plain, the whole set in a frame of desert peaks built of rocks—green, red, white, and yellow.

A peculiarity of the Bolivian glaciers—which they share with the glaciers of Ruwenzori and Kenya—is the dryness of their surfaces. Though some of the Bolivian glaciers are large, they send forth on to the plateau below them no glacier torrent of any size. Indeed, the stream—if we may so call it—draining

the biggest glacier of Illimani was a mere rill that could be crossed in a single stride. Of course this is due to the geographical position of these mountains, subjected as they are to the power of the tropical sun, which not only melts the ice but absorbs it at once in evaporation. The effect of this evaporation on the aspect of an ice-fall is very remarkable, the séracs having a peculiar saccharine appearance which gives an easily recognizable quality to the view of any tropical glacier.

MOUNT KENYA IN 1899

THE RT. HON. SIR HALFORD MACKINDER

I HAVE been asked to describe to you some critical episode in my journey to Mount Kenya in the year 1899. I always feel some hesitancy now in talking of that holiday many years ago, for since that time uncounted thousands of the younger generation have experienced adventure and danger in war, in the air, and on the high mountains. On this occasion however I welcome the opportunity for a special reason. At the end of last month a paragraph in the *Times* told of the death of a famous Alpine guide, César Ollier. He had climbed in many parts of the world, his best-known expedition being with the Duke of the Abruzzi to Ruwenzori. He met his death while making preparations for a chamois hunt; he was buried under a sudden fall of rock from the top of the mountain. The *Times* correspondent added that as the accident did not occur during the climb, and was not due to any fault of Ollier, his tomb will bear the proud inscription of the Alpine guide: "Il est mort. Il n'est pas tombé."

César Ollier was a great guide, a fine shot, and a fine man, both physically and in character. Will you please take the short story which I am about to tell as my homage to his memory, for he served his apprenticeship in foreign travel in my expedition to Mount Kenya? When he and his porter, Joseph Brocherel, joined me at Marseilles they saw the sea for the first time, having never previously left their native valley in Savoy except for their military service in a garrison town. All the way out by Suez to Mombasa, and then up from the equatorial vegetation at the coast to the now so well-known highland plains, nothing seemed to astonish them. They took everything as though they had seen it all before. We arrived on the Athi Plains just when the construction camp at Rail Head—for the Uganda Railway was then building—had moved on to the brink of the Kikuyu escarpment. Except for the track of twin rails, pegged down on widely spaced sleepers, the only signs of humanity in the broad landscape where now stands the city of Nairobi were the green tents of three little camps—my own and those of the District Officer and a trader. There one morning at dawn César and Joseph burst into my tent exclaiming excitedly, "Monsieur, les montagnes!" I went out into the freshness of the sunrise, and beyond great herds of game grazing peacefully within a few hundred yards saw to the south on the horizon 100 miles away the snowy dome of Kilimanjaro, and 100 miles to the north the twin peaks of Kenya, streaked with glaciers. César remains imprinted on my memory as he stood beside me at that glorious moment.

My friend Campbell Hausburg, now a well-known planter in Kenya Colony, had joined with me in the cost of the expedition. He was a first-rate shot and an admirable photographer. In addition we had two collectors, Saunders and Camburn, who had been recommended by the South Kensington Natural History Museum. Thus we were six white men and our goods were carried on the heads of 170 natives, half of them stark naked, for at that time there were in East Africa no horses or draught oxen or mules, and of course no motor cars. Part of the country we had to traverse was famine stricken, and had been disturbed by events connected with the Emin Pasha episode in Uganda. The temper of the natives was suspicious and dangerous. It took us three weeks, with an average advance of 5 or 6 miles a day, before we arrived on the Plateau of Laikipia at the western foot of Kenya mountain. I pass over our adventures on the road, and our first attempt and failure to climb the peak, and Hausburg's journey round the peak taking photographs, and the repeated threat of starvation which in the end compelled us to send to Naivasha, across an unknown country, the greater part of our force under the command of Hausburg. I stayed behind to make a final attempt on the peak, within a limit of time fixed by the supplies which remained to us. At that point I will read to you my diary for a few days with such changes as may be necessary to render it now intelligible.

September 8, 1899.—Hausburg left to-day for Naivasha, taking with him—since we could not feed them—all our men except Ali and fourteen porters. The other four white men will stay with me, to make a last attempt on the mountain. We shall thus be a party of twenty, five white men and fifteen black. We have nine bags of rice. I have given four to Hausburg and I retain five, or about 300 lbs., as potio for the men.

When the big caravan had gone we hid our remaining goods in the thicket by the Thegu stream and marched to Camp 18 at the foot of the mountain forest where we pitched the fly of a tent and spent the night.

September 9.—César, Joseph, Camburn, and two porters were despatched up to Camp 20 at the top of the forest, while Saunders and twelve porters went back to the Thegu to bring up the rest of the goods. Ali and I stayed where we were.

3 *p.m.*—Saunders has just returned with his twelve men. The goods we hid at the Thegu last night have been looted, possibly by Ngombe's people but more probably by the Nderobbo. By the greatest good luck Saunders evidently disturbed the thieves in the act. They had taken the useless Austrian guns, but not the ammunition, also the trade goods, but they had left precisely that without which we should have starved—twelve of our forty "iron ration" cases.

September 10.—We followed our beaten track through the forest up to Camp 20, leaving Saunders halfway up, where he is to build a fort for the protection of our goods and to make collections of animals and plants.

September 11.—César and Joseph went on yesterday to the peak. I now sent Camburn down with two porters to join Saunders, and myself left with five porters and went up to Camp 22 in the head of the Teleki Valley. The peak was again clear. What a beautiful mountain Kenya is, graceful, not stern, but as it seems to me with a cold feminine beauty. The head of the Teleki Valley with its ruddy cliffs, edged and lined with snow or hail, appears more beautiful

in to-night's sunset than ever before. Suddenly the sun must have sunk below the horizon, for the glow went and the whole scene chilled in a moment to an arctic landscape. Later the young moon gave it a third, less tangible, aspect. The Equator is ten miles to the north of us.

César and Joseph arrived before dark. They had been out prospecting. They have cut their way up the Darwin Glacier but could not descend, and have had to return by the arête on which we spent the night of our first attempt. They report ice so solid that twenty and thirty blows are needed to cut a step, and snow that is powdery, in reality fine hail. César has unfortunately hurt his wrist owing to the repeated shock of the hard ice.

September 12, 9.30 *a.m.*—In a blue sky a cloud from the south-east has suddenly shot up over Kenya Peak and spread in all directions, but high above the summit other clouds are coming from the north-east. Presently whirling sets in, due to the up-valley drifts, each whirl commencing with a peculiar shooting movement of cloud, marking the arrival of a new wind component. I am now becoming convinced that whatever may have been the case when we first arrived we have now a steady south-east monsoon and an equally steady upper north-east wind, both interfered with daily by the local wind from under the lee of the mountain and by the upward and downward, valley-guided, day and night breezes.

The five porters are sent down, and César, Joseph and I are left. It is five weeks since we left Nairobi with 170 porters, and we seem strangely alone.

We left camp for our final attempt at noon. At one o'clock we were halfway up the terminal moraine of the Lewis Glacier. There were many dead and some living tree groundsel on the lower edge of this moraine. At two o'clock we were on the south lateral moraine beside the crevassed and falling part of the glacier. There was a light wind blowing up the valley, and it was hailing.

We continued by the south lateral moraine for an hour and then crossed the Lewis Glacier to the couloir at its north-west head. The surface was covered with crisp new snow. We ascended the snow in the couloir for a little, and so gained the top of the talus which lies at the foot of the eastern face of the great south arête. The cloud had gradually risen from the glacier and we could see our track across the white expanse. There was still an occasional hailstone.

On the rock face were three *mauvais pas*—two traverses and a precipitous ascent of perhaps 30 feet. Our chief difficulty was with the loose condition of the stone which was very hard and full of rectangular crystals. The jointing was into blocks, many of them overhanging, and they often came away in the hand. By 5.30 we had climbed almost to the top of the arête and were pitching our little Mummery tent on our ice axes in a very convenient niche high above the Lewis Glacier. At 6 o'clock the equatorial sun set, but the air did not clear until the unusually late hour of 7 p.m. We warmed a small tin of soup. The night was calm but our bed on the rock was damp and very hard. We had just room under our little shelter to lie side by side, and grew stiff and cold-footed.

September 13.—Up at dawn—5.30 a.m.—the sky was clear above, but below, to east and south, was the far-spreading sheet of the cloud roof over the plains, with a dark gulf beyond, probably the Tana Valley. The eastern horizon was lost in a mist of indescribably magnificent purples and reds, a vast abyss of mere colour. We were away upward just as the sun showed over the

horizon, giving us a grateful touch of warmth. Soon we reached the site of our previous bivouac on the crest of the arête. Then we descended on to the ice-slope beyond, traversing by steps the top of the Darwin Glacier and so came to a smaller arête which divides the head of that glacier. Here a biscuit-tin marked the turning-point of the reconnaissance made two days before by César and Joseph.

We now followed the arête upward, thinking that it would guide us to the lesser of the two summits, and from this we hoped to cross by the col to the greater. But after half an hour it became too steep to climb, and we were obliged to drop on to the hanging glacier to our left which depended from the col between the summits. To cut steps across this glacier direct to the higher summit was the only way left to us.

At this moment, 8.30 a.m., high above the cloud roof over the plains, but still below us, a tongue of cloud came suddenly driving southward along the western slope of the mountain and then, turning south-eastward, crossed the heads of the Hohnel and neighbouring valleys obliquely. Presently another cloud tongue shot southward from east of the peak and turning inward met the first, and the two whirled spirally upward, forming a huge threatening column towering above us, but the peak was still sharply defined against the blue sky as we paused in the cutting of our steps across the steep face of the ice.

It took three hours to cut our way across this hanging glacier to the farther side of the gap between the two summits, and I gave it the name of the Diamond Glacier. At first we traversed the ice obliquely upward, each step requiring thirty blows with the axe. There was a thin covering of snow. Then we turned a little towards the base of the lesser summit, but seeing no foothold on the rock we resumed our oblique traverse upward towards the greater. The glacier was steep, so that our shoulders were close to it. Had we fallen we should have gone over an ice-cliff on to the Darwin Glacier several hundred feet below.

At last we reached the stone again, and almost exactly at noon set foot on the summit, which is like a low tower rising out of a heap of ruin, for the lichen-covered rock is vertically and horizontally jointed. On the top were three or four little turrets close together, and on these we sat. A small platform a few feet lower adjoined the south-east corner of the crag, and from this I got two shots with my Kodak of the summit with César and Joseph upon it.

I read the aneroid twice, throwing it out of gear between the readings, then ascertained the boiling-point, and took the temperature with the swing thermometer. There was a light north-north-east wind. The second peak bore 135° magnetic and we estimated that it was about 30 feet lower than that on which we stood. I broke off a fragment of the highly crystalline rock. The delay on the glacier had allowed the midday cloud to gather round the peak, but the sun shone through from above, and there were great rifts in the drifting mist through which we looked down on to the glaciers and arêtes beneath, and away beyond into the valleys radiating from the peak. We remained about forty minutes on the top.

Then we scrambled down into the col between the peaks. The temptation was great to make an attempt on the second, for the way up from the col did not appear difficult, but a storm was threatening and we were not equipped to spend another night on the mountain. We therefore returned over the

hanging glacier, clearing the freshly fallen snow from our steps. It was fortunate that we had cut them deep. By 6 p.m. we had reached our resting-place of the previous night. There was still the treacherous face of the arête to be negotiated, but we continued down by the light of the half-moon and the sheen from the glacier below, throwing most of our gear over the precipice beforehand. It was not until 8.20 p.m.—for we were all tired—that we set foot on the Lewis Glacier, and not until 10.20 p.m. that we arrived back in Camp 22, hungry and weary, but triumphant.

Our times indicate a slow descent, and I was the chief cause of this. Beyond a spoonful of soup at night-time, I had nothing to eat for nearly thirty-six hours, except a few meat lozenges and an occasional bite of Kola biscuit. Starvation seemed the only remedy for the lassitude I experienced in our first attempt. The remedy succeeded admirably during the ascent but naturally had to be paid for during the later hours.

The light effects were wonderful that evening. On the hanging glacier we had frequently been enveloped in the cloud, which shielded us from the equatorial sun, but at sunset we came again into the clear air on the top of the southern arête. All the eastern horizon was glorious, with a deep purple belt rising like a wall from the end of the landscape. Three hours later, as we trudged home over the Lewis Glacier, the great features of the mountain stood out as though boldly sketched in black and white crayons. The upper end of the glacier rose in snowy billows to the point of Lenana on the one hand, and on the other skirted the foot of the cliff by which we had descended, now black in the shadow cast by the moon. Below was the white expanse of the cloud roof flowing dreamily beside the solid texture of the ice. Most striking of all were the sheens and jetty blacks on the pinnacle of the Lion's Tooth.

The midnight scene as we supped by the camp fire I shall never forget. The sound of the Nairobi torrent, swelling suddenly from time to time as the breeze changed, and even the occasional hoot of an owl, made no break in the silence of the great peak standing brown and white in the glare of the setting moon. The Pleiades twinkled over the centre of the Lewis Glacier, but overhead the stars in the black vault were steady and without twinkle. Our camp was on the broad floor of a deep valley, shut in by steep slopes to north and south. To the west was a moraine of great blocks and tree groundsel. To the east were the red cliffs, and to the north-east the Lewis Glacier and the peak. Those evenings, this the most wonderful of them all, were spent monosyllabically, warming our hands and feet at the fire amid the mysterious shadows of the tree groundsel and the white gleams of the creeping groundsel. Our thoughts and our words were divided between our conquest and the red cinders which spoke of home, until presently the scene around broke silently into our dreams, compelling worship. Then, as the fire dulled and our feet grew chilly the bark of a leopard ranging the hillside opposite reminded us of the early rise on the morrow, and with a drink of the cold water from our camp spring we rolled ourselves up in our blankets without undressing, for warmth could not be wasted at Camp 22.

There I close the diary. We still had time to carry round the peak a plane-table survey, and then we crossed the Laikipian Plains and the Aberdare Range, lying down each night under the stars, with fires to protect us from the wild

beasts. It was the freest and happiest part of the journey. We arrived at Naivasha with our stores reduced to ½ lb. of tea, like the good driver of an express train who, it is said, should enter his terminal station with white-hot bars in his furnace but every ounce of fuel consumed.

THE *ENDURANCE* IN THE WEDDELL SEA

J. M. WORDIE

IN the Antarctic shipwreck is fortunately a rare event. Among whalers in recent years the number of ships lost is increasing, perhaps not unexpectedly, as wooden hulls are no longer a working proposition; among exploring vessels the wreck of the Swedish *Antarctic* in 1903 and of the British *Endurance* in 1915 stand out as exceptions to the general good fortune which has followed most of the big expeditions.

It is often said that misfortune brings out the qualities of leadership. Judged in this way the voyage of the *Endurance* gave an opportunity denied to most British explorers. In 1881–1882 Leigh-Smith most ably rescued the crew of his yacht *Eira* from Franz Josef Land; and over thirty years later similar events in the Weddell Sea found Shackleton facing a similar emergency. The cases have much in common. For the *Endurance*, however, the conditions were more prolonged, and the various fortunes and events make that adventure without parallel in Antarctic history.

Early in 1915 a landfall had been made on the north coast of Coats Land, and Bruce's earlier discoveries had been confirmed. The coast was mapped southwards for several hundred miles, care being taken to follow the edge of the land as closely as possible. On January 18, however, the ship was forced some distance from the coast in order to avoid heavy pack, north-easterly winds freshened to a gale, and she was driven far south towards the head of the Weddell Sea. The floes packed before the wind, and with falling temperature set fast round the ship; as a result, she was effectively beset, and henceforth drifted where taken by the ice-floes. The wanderings of the ice depended on the strength and direction of the winds, but the resultant drift was always to the northwards, and at the end of nine months the ice had carried the ship over a distance of more than 600 miles from point to point. Spring was at hand, and everything seemed to indicate that in due course the ship would once more be free. Events, however, turned out very differently. The surrounding pack commenced to crack and partially to open, and early in October the ship's position had to be changed. More than once she rose to the ensuing pressures, but in the end, on October 24, caught between three floes, she failed to rise, and a few days later was crushed and destroyed.

The last days had given time to prepare for the worst and to face the problem of twenty-eight men stranded on ice-floes more than 300 miles from the nearest sighted land. None knew the size, the habits, and the destination of these floes. The equipment saved from the ship included three of the boats, five tents, sleeping bags, and about two months' food. To remain in camp on the ice meant ultimately reaching the open sea, but at what place or at what season was

completely uncertain. In this emergency Shackleton decided that a sledge journey westwards towards Graham Land must at least be attempted. Two efforts to do so, one early in November and a second two months later, both failed. Failure was due partly to adverse surface conditions, but more to the extreme slowness with which the ship's boats could be moved forward; it would have been impossible to reach land till long after the close of the summer season. Sledging gave no hope of success, and the only alternative was to wait on the pack till such time as the ice should break up in the open sea.

There was reason to think that a break-up and scattering of the floes might happen any time during the summer, but the first months of 1916 passed and there was still no change, close-packed ice extending in every direction. Already in January the continual drift had carried the camp on the ice-floe north of the Antarctic circle. In March a faint swell was noticed on one occasion, but it was not repeated till four weeks later. These were difficult days. At first some regretted that sledging had failed, and felt that it might have succeeded by abandoning the boats. Now the same men were anxious to launch the boats in undue haste. Shackleton kept his men together, and in the end won their approval for each single action.

On April 9 the pack opened and scattered with almost startling rapidity, and the three boats were launched. After five months the pack had almost come to mean security, and to leave it was to face unknown risks. The events of the next few days followed one another with strange and dramatic suddenness. Tide and current made navigation very difficult and the floes on which night camps were pitched broke without warning. On the third night we crouched in darkness in the boats while all round whales blew and the oily vapour drifted across the boats. There followed a day of sunshine when seals were seen basking in countless numbers on every floe. Early on April 13 we passed from leads to large pools, and through streams of ice, and then to open water unbroken to the horizon. To escape from the ice had long been our dream, and as we left the last ice-stream we all cried that we had reached the open sea; the words were the same as Xenophon's, and in saying them we each revealed our secret fears and hopes. In the two days following we rowed and sailed, making for Elephant Island, but hindered by currents and by poor visibility. On April 14 we rowed all day towards the island; as evening drew on, however, we found, in spite of all our efforts, that we were now being swept away from our goal. The wind rose that night; we hoisted sail, and, close-hauled in the darkness, we could only hope that we might still keep some land a-lee; we sailed blindly, but next morning as day broke crags loomed in the mist, and we were able to make a landing a little south of Cape Valentine.

To have reached land was an amazing piece of fortune; beyond Cape Valentine was open sea; a few hours more and we should have been beyond the cape, incapable of beating back to windward, and with the last chance gone of making land. In the next few days Shackleton's characteristics came out very strongly. He realized how easy it would be, after the long ice drift and the hardships in the boats, to surrender initiative and fall inactive. The temptation to remain inert at Cape Valentine was not perhaps a strong one, for the position was a narrow storm-swept beach, on which a permanent camp was impossible, and as soon as possible a better site was found and occupied at Cape Wild.

Much stronger was the temptation to remain at Cape Wild and not to risk the open boat journey of 800 miles, or at least to delay it till the next season.

No decision on this expedition does more credit to Shackleton than his immediate preparations for a journey offering such very small chance of success. On other occasions he had acted promptly or delayed advisedly, and had shown a foresight in doing the right thing which was almost preternatural. In the days while the boat for the ocean passage was being prepared the weather took a turn for the worse, and all hope of a voyage except under winter conditions and in seas notoriously stormy had disappeared. I have a clear memory of the *James Caird* launched and manned ten days after we landed. Her diminutive sails gave no sense of strength or sufficiency; and the weather conditions and pack-ice sighted that morning on the horizon brought little encouragement. Shackleton faced a bigger risk then than at any time on his great southern journey. His success sixteen days later when he reached South Georgia, and the certain knowledge now of how he thus saved his men, are not likely to be forgotten. Success was not mere chance: it depended on leadership, on judgment, and on a strategic sense peculiar to Shackleton; it had attended him on his southern journey and it had not failed him a second time in a still greater emergency.

The PRESIDENT: I am sure you will all wish to express your sense of gratitude to the five famous explorers who have addressed you this afternoon. (Applause.)

THE CENTENARY DINNER

ON the evening of Thursday October 23 the President, Council, and Fellows entertained the Delegates and Official Guests at the Centenary Dinner in the Connaught Rooms, when His Royal Highness the Prince of Wales, Vice-Patron of the Society, presided, and among those present were the French Ambassador, the Earl of Cromer (Lord Chamberlain) and the Countess Cromer, the Delegates from Kindred Societies and Institutions, Foreign and British, with their ladies; and about 650 Fellows of the Society with a few private guests: the limited space making it impossible to allot seats for guests to most of the Fellows who applied for them.

H.R.H. THE PRINCE OF WALES proposed the toasts of "The King" and "The Sovereigns and Heads of States which are represented by Delegates," and these having been honoured,

THE PRESIDENT proposed the toast of "The Queen, the Prince of Wales, and the other Members of the Royal Family."

H.R.H. THE PRINCE OF WALES, in acknowledging this toast and proposing the toast of "The Royal Geographical Society," said: I am very grateful for the manner in which you have received the last toast and, at the same time, I would like to assure you how proud I am to be in the chair at such an important gathering. The Royal Geographical Society's Centenary makes indeed an important gathering, and I am proud as well to propose the continued prosperity

of a society which has won for itself an unrivalled international position. My ancestors and my family have been continuously connected with the Society ever since its foundation.

Now we have all been interested in this great Society. We have had in our hands during the last week Dr. Mill's Centenary Record of the Society which, I will not say unlike most, but certainly unlike some records of its kind is extremely good reading. It is light reading, and it tells how this Royal Geographical Society grew out of a dining club with what Dr. Mill calls "the amiable custom of the members contributing to the dinners viands and drinks brought from far away." We may either regret or rejoice at the absence from to-night's menu of Lapland reindeer, of Mexican ham, or of other choice delicacies from far-distant lands which figured in those early repasts; but, ladies and gentlemen, to-night we are most certainly compensated for the absence of those delicacies by the fact that we have a most distinguished company with us.

When speaking of the centenary of a great society one's first thought is, naturally, as to how it originated and who were the founders. To-night we must remember those whom we consider the founders of this Society—the eldest Sir John Barrow, and the youngest Murchison, who, as President, in 1869 admitted as Fellow Mr. Freshfield who is with us to-night. (Applause.) The first treasurer was John Biddulph, and his great-grandson is treasurer to-day. The fourth President was Hamilton, who secured that great relic the Rosetta Stone for the British Museum and brought the Elgin Marbles to England. His great-grandson will in a few days take office as President. As in all great societies in this country, you see that continuity of interest and tradition have been the outstanding features of the work of the Royal Geographical Society; and, as all great societies in Great Britain, the R.G.S. has maintained the most friendly relations with foreign geographical societies and individuals by nomination of honorary members and the award of the Society's Royal Medals. I believe that it is a matter of history that one of the last opinions expressed by my ancestor King William IV was that the medals of the Royal Geographical Society might properly be conferred upon gentlemen of other nationalities than British, since when many foreigners have received them, and there are some of them with us to-night. And, gentlemen, as one who has travelled and therefore been greatly encouraged to study the voyages of those who excel in the art and science of discovery, I can most cordially endorse the opinion of my ancestor King William IV.

The history of the Society is very closely linked with the romance of the great British explorations of past centuries. In these days of conducted tours to the sources of the Nile, and journeys in the luxurious comfort of the *wagons-lits* to Jerusalem, and even of flights over the most inaccessible parts of the Dark Continent, at a time when very little of the Earth's surface remains unmapped, we are, in these comfortable up-to-date conditions, apt to forget the period when vast stretches of territory were completely blank and only traversed with the greatest possible discomfort and the greatest possible danger and hardships. As I have already said, I have travelled a great deal; I have travelled under the most comfortable conditions possible, and I have also travelled for a considerable number of miles; but I have at times had the

opportunity, shall I say, of straying off the beaten track, as have some others, the more fortunate ones of us who have travelled in remote parts of the world on various quests, whether scientific, sporting, or photographic. We have had the opportunity of straying off the beaten track for a few days or, maybe, a few weeks, and of just being able to understand a little of what the great explorers of the past had to endure, and—may I use a colloquial saying, gentlemen—"we take off our hats to them."

I might divide exploration into two categories: first of all, exploration originated for scientific reasons. Unfortunately, I am not a great scientist, but I know the wonderful work scientists have done. Exploration has also a great practical value, and there have been opened up great regions that we as Britishers, and also foreign countries, have been able to develop, thereby giving openings and opportunities to those who would not have had them had the explorers stayed at home. So we are most grateful to the great explorers. This great Geographical Society has helped them; it has supported exploration, and is supporting exploration now. The days of opening up great expanses in unknown regions of the world are passed, but now the Royal Geographical Society is concentrating far more on the mapping and on the geographical side—and what more interesting and fascinating study is there than geography?

A word as to the Centenary which this Society has celebrated by completing an ambitious building scheme. My brother the Duke of York opened on Tuesday last some very fine new buildings which are not only a necessary addition to the Society's working strength but also, I understand, a monument of which all may be proud, and especially the generous benefactors who made the scheme possible. I can assure you, Mr. President, that I look forward to visiting this great building before very long. But to-night I congratulate the officers and the Council, the architect and the contractors, on the success of their efforts to complete Lord Curzon's scheme.

In giving you the toast of the evening, I couple with it the name of your President. Sir Charles Close is an old Sapper; he is an officer of that great Corps of Royal Engineers which has given famous men to the Royal Geographical Society; and may I say that he is a great surveyor and a truly scientific soldier. He gives up his office in a few days to be succeeded by a famous admiral—Admiral Sir William Goodenough—who has seen service in Africa and in China and who I know will carry on not only the traditions of the Society but the traditions of his family. Your President may well feel proud that the Society's Centenary brings with it a house and equipment worthy of the Society's purpose—the advancement of geographical science. I give you the toast of prosperity to the Royal Geographical Society, and couple with it the name of your President, Sir Charles Close.

THE PRESIDENT, in responding, said: We are all deeply sensible of the honour which Your Royal Highness has conferred upon us by presiding to-night as the Society's Vice-Patron. We are very grateful to Your Royal Highness for the kind words which you have spoken about our Society and we shall do our best to deserve them in the future. Our Society has benefited very greatly by the patronage of the Royal House in this country; in fact, without that patronage I do not think the Society would be where it is to-day.

Now let us carry our minds back one hundred and four years to the autumn

of 1826 when Captain Broke, F.R.S.—who, in spite of all the admirals present, was an Army officer—and his four friends first put forward the idea of a geographical dining club. Captain Broke thought it would be a good thing to get travellers to dine together—and a lot of good things have been done at dinners. For instance, I would cite the foundation, perhaps not the original foundation but in any case the proper stabilization of that great work, the International Map; Professor Penck, whom I am very glad to see with us to-night, will agree with me that that stabilization was partly due to a dinner which took place at Geneva. As most of those present know, Captain Broke's idea resulted in the formation of the Raleigh Club on 7 February 1827, which Club was one of the forebears of the Royal Geographical Society. The Society was peculiar in that respect. I understand from Dr. Mill's book that it had no less than four parents. At any rate, the principal parent was the Raleigh Club, a dining club. Now in the year 1830 that Club gathered together its own members and several other gentlemen, for at that date ladies had not appeared on the geographical horizon. I am glad to say they have since appeared; one-tenth of our Fellows are now ladies and we have a lady member of Council. Well, no time was lost, for on 6 July 1830 the first meeting of the Royal Geographical Society was held. H.M. King William IV approved of the project and graciously accepted the position of Patron of the Society, while H.R.H. the Duke of Sussex became the first of the Vice-Patrons, of whom His Royal Highness the Prince of Wales is the last. We are very glad indeed to preserve this continuity, and we feel that our Society has benefited enormously by the patronage thus extended.

The founders would have rejoiced if they could have foreseen the future, though I think they would have looked upon it as a somewhat troublesome job if they could have foreseen that they would have had to provide a dinner for 771 diners—I am careful about the "one." Nowadays, thanks to our Secretary and Honorary Secretaries, that is really no difficulty. Our founders would certainly have rejoiced if they could have foreseen the hundred fruitful years which were to supervene. During that time the Royal Geographical Society has been very closely in touch with the great company of British geographers: with Livingstone, Burton, Speke, Grant, Kirk, Baker, Thomson, Franklin, Ross, Parry, McClintock, Scott, Shackleton, Colby, Yule, Everest, Godwin-Austen, Murray, and with, of course, those members of our Council, Barrow, Murchison, Galton, Markham, Curzon, Keltie, and Hogarth, all of whom, and many others, were great stars in the geographical firmament. We also believe that we have been privileged to enjoy the friendship of foreign geographers of all nations, who have helped to explore this ancient globe, to reveal its secrets, and to explain its mysteries. All these past friends and Fellows of our Society did in their day what was in their power to extend our knowledge. We gratefully remember their successful efforts and strive to follow in their footsteps.

Now we hope and believe that the Society is a focus of the activities and studies of those concerned with Earth-knowledge, for we do not limit ourselves to any one particular aspect. We are most anxious that the new home of the Society—and by that I mean the old home enlarged—should be considered as a national home and centre for all geographers and for all whose work brings them into contact with geography—and their name is legion. All must base

their studies on the sure foundation of Nature, the terrestrial environment. In fact, we welcome to our Society and House all who desire to know more about this world as the home of Man.

Humanity is, in this age, daily becoming more conscious of itself. It meditates upon its past; it is not always perfectly content with its present and it is a little anxious about its future. But there are signs that humanity will take more and more its future under its own direction, and will no longer put up with the haphazard methods hitherto tolerated. With this new outlook there is bound up the need for a better study of Man's terrestrial environment—the study with which we as geographers are directly concerned. The directed future of mankind is, indeed, dependent upon the use to which mankind can put the Earth, that great heritage that has been given to it.

Our Society will perforce, and willingly, more and more interest itself in the human relations of our heritage. We have, we believe, some reason to be satisfied with our past labours; we embrace the new outlook. We are happy when we think upon our growth as a society; we recall with affection our roll of honoured names; and, when we peer into that mysterious region of the mind, the future, we believe that we can see our destiny unfolding itself in a happy, increasing sequence of services for mankind.

ADMIRAL SIR WILLIAM GOODENOUGH (President-Elect) proposed the toast of "Kindred Societies" and said: This is a very delightful occasion and, Sir, you have charged me with a very delightful part. Two days ago we had the honour of presenting to H.R.H. the Duke of York, representing His Majesty, those delegates who had come from all parts of the world to assist the Society in its Centenary Celebrations, and to-night I ask you to drink to their continued prosperity and progress and to draw closer those bonds of friendship that unite them in so marked a manner to us and to each other. It might seem almost a repetition of some of the things which Your Royal Highness said and which the President said when I say that geography is no one-sided science; it has many tributaries, many ramifications. If I recounted them all it would seem as if I was reading out of a dictionary, but each of them add to the knowledge, interest, and happiness of mankind.

I am not quite sure, Sir, that I would entirely agree with what has been said about the ease of travel. I do not believe that the world is so shrunk by reason of the ease of communication that there is nothing left to discover and very little to uncover. In exploration alone there is a mountain perhaps almost as high as Everest itself that has still to be geographically determined, and there are plains capable of cultivation as broad as the deserts, and mines as deep as Golconda to be discovered. All that is waiting for what we and our kindred societies working together can, in some measure, supply. There is a single instance which comes to my mind at this moment in this connection, by which the sufferings of many thousands have been greatly alleviated, and that is the collection by that most beloved President, Sir Clements Markham, of the cinchona plant in Peru and its transplanting to India. There must be the advance guard, the prelude; after that come all those intensive studies of human, regional, climatic and other conditions that it is the business and the privilege of societies such as ours to investigate, record, and report upon. It it most important—I am sure you will forgive me if I am a little emphatic—that

all schools and colleges should be encouraged to see that knowledge of that nature is imparted to the younger generation.

I wish that time allowed of the mention of each society and each delegate, but since that is impossible I beg all to believe that the welcome which we offer them and the thanks we ask them to accept for coming here are most hearty and most sincere. But some I would mention. Dr. Charcot and his illustrious colleagues, General Bourgeois and M. de Margerie, men of science and of action, too. Charcot himself an explorer and a constant answer to that question that the name of his ship puts to the world. We have with us Dr. Lauge Koch, Mr. Carsten Borchgrevink, while Knud Rasmussen was prevented at the last moment from being in attendance, all members of that intrepid band who by disinterested travel have revealed to us the secrets of the vast solitudes of the Polar regions, who as much as any, I should say more than most, think of their predecessors, many of whom have not come back bodily from those desolate but alluring regions, many who would have been of an age to have been here to-night. Whether their work is finished or not—the work of Lauge Koch is far from finished—they may think with pardonable pride that it is their effort and their work which has inspired the gallant and ardent spirits who are at this moment carrying on investigations in the north and in the south.

We welcome many of our friends from the Northern Continent of America, Professor Brigham of the Geographical Society of America and others, and although to our great regret Agustin Edwards was prevented from coming by indisposition, we have Señor de la Barra and others from the Southern Continent of America, a country of vast possibilities of further geographical research. We have with us also Cav. Filippo De Filippi, and Dr. Almagià; we have representatives of all races and nations who have ever been foremost in exploration and cartography, and to whom we are indebted both in the past and in the present for some very beautiful maps, as all who study or make use of that beautiful Italian Atlas will agree. The countrymen of Hondius, Blaeu, Mercator, and Ortelius are with us, and men from the Amazon, the Andes, and from Japan and China.

If I may refer back for a moment, I shall not be going beyond the province of my toast when I say the name of De Filippi brings to mind how much we all hope that that most gallant young explorer and mountaineer, the Duke of Spoleto, may soon recover from the serious accident which befell him a month or so ago.

My survey is really incomplete, Sir, because I have not even mentioned those of our own country or of the Dominions, but it covers a great deal of ground and it is not only with pride but with pleasure that we can say, embracing as we do the kindred societies, that we encircle the world. Those who are familiar with these subjects will have been surprised, and rightly surprised, that I have omitted to mention one name and one group of names. The reason that I have kept them to the last is that I propose to ask the leader of them, together with Dr. Charcot and Professor Brigham, to reply to this toast, a man who with his colleagues is a countryman of the great Alexander von Humboldt. I refer, Sir, to a man who has devoted his life to scientific work and research in all that concerns the sea and the earth, whose writings are now and will always be a very great influence in the trend of thought in these directions. His name

will be the last word of my most inadequate speech, and I now give you the toast of the Kindred Societies, coupled with the names of Dr. Charcot, Professor Brigham, and Professor Albrecht Penck.

DR. CHARCOT: Certainly no one is more astonished than I am to be called upon to respond to the toast just proposed to this distinguished assembly. I have absolutely only one qualification for speaking, that of being the delegate of the French Geographical Society. This honour I would not have had if the President of that Society had not been obliged to stay on the other side of the Channel. First of all, I will respond on behalf of the Society I represent—and for this I am qualified as a member of the French Society. I may tell you that it is with the greatest friendliness, the greatest admiration, that in the name of all of them, many more qualified than myself to speak this evening, I bring you hearty congratulations and best wishes for many more centuries of prosperity and activity of the Royal Geographical Society. I have only one excuse for speaking. It is that I read Shakespeare, and in Shakespeare I saw one passage that I like more than any other in which he says that of all the bad qualities of mankind the worst is ungratefulness. That is why I wish to express my gratefulness. The honour that I have of speaking to you this evening is due to the fact that I have been prompted by the example set me by Great Britain. When a boy I was brought up by a Welsh governess, and when I was young it was always the English who were going on exploring expeditions. The example they gave to the man I am they gave to all my countrymen. I know we did good work in the past, and I do not want to belittle my countrymen when I say that the good work done in the past was done because they wanted to do as well as the English. If in the future we continue to work in line with your great country we shall be helping you in the vast work of doing good to humanity and to mankind.

PROFESSOR ALBRECHT PENCK: Being charged to express the feelings of the kindred societies I must pray that you will allow some personal words to the President this evening. Many years ago I conceived a plan for a uniform map of the world, and the man who was able to bring the map into existence was Sir Charles Close. I am glad of the opportunity of saying that before this Society, speaking as President of the German Geographical Society to the President of the Royal Geographical Society and, at the same time, speaking as an Honorary Member of the Society in London to an Honorary Member of the Berlin Geographical Society. I think of the relations between our two societies. Indeed, they are both devoted to geography, but with a great difference. There is, however, one feature common to both—they both arose out of dining clubs. In the Club in London there met travellers and explorers who had returned from voyages in various parts of the world, and there were some learned men who were delighted to hear something of the world, to read papers, to make communications. It was Alexander von Humboldt who one day sent the first number of the *Journal* of the Royal Geographical Society to the members of our Society, who were very glad to receive it, though there was a certain amount of envy among them. They were sorry that they had not the opportunity to bring out a journal such as yours. They waited ten years and then they brought out the first number of the German Geographical Society's

Journal. Our Society was a private Society in Berlin; yours extended over the whole world. You were always in touch with explorers. With us professors played the rôle. So it is even nowadays, but in some ways that state of affairs has changed. I am happy to tell you that Dr. Wegener has now reached the centre of Greenland for the purpose of making observations as to the thickness of the inland ice, which is proving to be far greater than was anticipated. Whilst in the past the interest of members of our Society lay in scientific forms of apparatus, now they are beginning to see some of the world for themselves, and I am happy that I am able to express in London my gratitude to the British Association for the advancement of Science, and that I can refer as well to Canada, South Africa, and Australia: to me a very great advantage. A professor, you know, gets his ideas from books and is very happy if he has an opportunity to voice the views he has gained.

Many years ago when I came to England for the first time, I learned very much from my old friend James Geikie and became acquainted with the works of A. C. Ramsay, who gave such an excellent explanation of the surface forms of Great Britain. On my return to Germany I published two papers on the surface of Great Britain and the surface of Scotland, in which I reproduced what I had learned from those great masters. There were Hunter, Sir Charles Lyell, and Darwin, who was enunciating his theories of evolution, and inspiring all with his spirit. That is the spirit I owe to you British—I learned it in your country; I learned it from your scientists. You see science has no boundary line. We learn from one another. It is one universal science which you have cultivated in such an excellent way in your Royal Geographical Society. You have done so much for the exploration of the whole Earth. We learn from you and we do our best. We continue to work at home and we communicate to others. I hope that will be the future of the evolution not only of Europe but of the whole world. It has become very narrow and many walls have been erected between peoples. Let us haul down those walls in the advancement of science. You in your Society have no walls of this kind. I am proud to be honoured by your Patron's Medal. You have in the Chair as President a man who has extended surveying from Great Britain over the whole world; you will in future have at the helm of the ship, which is sailing so well in a straight line, an Admiral who being Goodenough will be enough!

PROFESSOR A. P. BRIGHAM: I am sorry, as I know you are also, that the American Ambassador could not be with us to-night. I have been commanded by those in authority to sit in his seat and to rattle about in his shoes. So it is I have the honour to bring you the greetings of the American Geographical Society and I may say of all the geographers of the United States, and we have many more than we used to have. Thirty-two years ago there was not a working department of geography in any American university. Now, following your lead, it is not respectable for any university not to have a department of geography. Your Royal Highness, Great Britain is our motherland, in language, in letters; the English literature is our literature, and we look back upon it with pride and look to it with pride. We owe to you, largely, our blood—much more largely than some people think. I cannot give you statistics —this is not the time!—and in no small measure in our growth in the noble science of geography we owe you a debt. In debt as we are to the geographers

of France, to the geographers of Germany, to the geographers of Italy, and many other lands, the Royal Geographical Society has been to us a living spring of exploration and of power.

When forty geographers—and I have the extreme pleasure of seeing some of them here to-night—of Europe in 1912 did us the honour of being the guests of the American Geographical Society and of seeing America, the Governor of Minnesota told us that he had never expected to see so many men who knew so much about the Earth and owned so little of it! But, Your Royal Highness—I think I can say this—it is very fine to get into the British atmosphere, even though I am a little crude as an American. Coming back to the Governor of Minnesota, it is not by title deeds but by knowledge that geographers own the Earth. For a hundred years there has been no mountain so high—you will get to the top of Everest yet—no ocean so deep, no desert so dry, no ice so cold or so bare, no jungle so remote, no tree so frail or so high that the men of the Royal Geographical Society have not set out to make it their own. We of America watch your deeds, and to-night we bid you God speed as you start upon your next one hundred years.

DANAKIL TRAVERSED FROM SOUTH TO NORTH IN 1928: *The third and concluding part, continued from page 414, of the paper by*

L. M. NESBITT

COMING out of the wide Gaiara canyon, bound on both sides by chalky cliffs, we turned to the left and steered due north, skirting the glistening white wall, some 200 feet high, of the chalk deposit. This was indeed a wall, ending abruptly and vertically, and stretching ahead northwards in almost a straight line till all was lost in the haze which covers the desert: a white diffused glare, as of dust illuminated by a darting sun, sky and earth becoming one colour, one light, one unspeakable fogginess of a furnace at white heat. The intense heat was felt in the ball of the eye, in the nostrils, and on the cheeks. As we were marching a terrific Kamsin started. This obscured the sky, so that at 4 p.m. it seemed twilight as at 7 p.m. The sand was blowing at about 30 miles an hour, and the dunes shifting almost before our eyes, like breakers rolled by a storm and with spray rising from the top. The camels had to stop and bury their heads, and we stopped too, though our faces and necks had been swathed in lengths of cloth and towels as a protection against the heat from the beginning of our march. Now we wrapped them closer, but the fine sand found its way everywhere. The wind at last abated somewhat and we went on, climbing and descending dune after dune, sinking knee deep, men and beasts, on the sloping side and labouring on the other, the steep one. At 7 p.m. we came out of the desert and found the chalks and basalts mingling again, the latter especially to our left soon after rising in sheer black vertical walls, a series of them, one behind the other, a sight to inspire awe, especially as we now were marching between such narrows. We were going north-north-west, forced in such a direction by the run of the walls. These black, vertical, rough bulwarks were some 250 feet high and probably at the top not more than 30 feet wide. They seemed like walls of a giant city and rose straight from flat white clayey ground, perfectly level and contrasting to touch and sight with the volcanic material on both sides. The valley, or rather corridor, we marched along was not more than 200 yards wide. We stopped after a while, as it was now dark, and we were all feeling very tired after the day's hardships. The place is known as Adda Marmariti, but there was no water there.

We slept till the moon rose and then loaded up and were off at 3 a.m. The road now took us over basalt hexagons of columnar structure, next trachytes and lavas, rendering progress very hard though not as heavy as in other similar instances because the flow of the volcanic material here in some places offered a fairly smooth surface whereon the weary foot could find a hold. We climbed and climbed, often meeting sheer vertical walls which had to be detoured until a scalable point could be found. The sun rose when we were almost at the summit of our march, and from that lofty plateau of black scoriae and lavas a good view of the Afdera volcano ahead of us was obtained. It is a very prominent landmark, but we had lost sight of it for several days through being in canyons and low-lying places. This volcano gave its last sign of life in 1915 when a great eruption took place. It rose before us in a beautiful

truncated cone on top of the broad curve of the former eruptions, the five successive steps which form the broad back of the volcano being barely distinguishable from where we were now.

We walked on fairly level lava flows, with the Sodonta Plain in the distance to our left, and next descended a fairly steep basalt wall, a hard zigzag path for our poor camels, met the lower lava flows, and went on on this new terrace gently sloping to the north-west. On the edge of it we saw against the skyline, a little to our left, a tomb of very good shape and very regularly built. The guide told us that it was built in memory of Muhammad Daza. We went on and on, always keeping an eye on our camels loaded with *girbas*, anxious that they should not rub against one another and rip them open, anxious too about any dripping, trying to save our store of water to the last drop.

We were marching on thus when on a flat space, where erosion and wind had laid down a thin layer of clay and sand, we came across a shallow pool of water, about half an inch deep, and the size of a bed sheet. The slime under this stretch of water, just ready to dry up in a few hours, soon made it unfit for drinking as the whole pond became in five minutes a mass of liquid mud through beast and man wanting to get at it. I was fortunate enough to drop in time on my hands and point of my toes and, so stretched out horizontally towards the centre of this small dishful of water, to drink, my chin and nose buried in mud. With every mouthful I absorbed a cloud of slime too, but I only stopped drinking when the water became so thick and unpalatable that I felt no more desire for it. After we had all had a drink and refilled our water-bottles with a mug from small hollows dug out in the mud, we continued our march. Suddenly from our fore group of camels came repeated shouts of "*Elmoia katir*," "much water, much water." We all rushed forward, and looked anxiously about because no apparent sign, or reflection of water, was visible, even when we arrived at the very group of men and camels. But we soon learnt where the precious element was. In a deep basalt crack and not more than 8 inches wide, was water, 5 feet down, plentiful, clean, and still; but the problem was how to get it out. It was beyond arm's reach in depth, for the first men who arrived there and had by mere luck chanced to walk very near to the hole and so seen it, had already tried to get at the liquid. They had removed by strength of fingers and nails the few rocks severed by weathering, but had not yet succeeded in bringing the water within reach. Some rushed to the camels and got buckets, but nothing would pass through the narrow crack, and to satisfy the thirst of over twenty men and twenty animals, and fill a dozen *girbas*, etc., by lowering bottles would have been too lengthy a business. At last I solved the problem by tying two mugs together at the end of my walking-stick, and so obtaining a double dipper with which I began to dip and ladle so fast that bucket and *girba* and *girbetta*, and all sorts of tins and cans were filled one after the other faster than they could be drunk.

We all now drank to satiety, and filled every possible holder. Altogether we stayed forty minutes at this hole and were glad of the short stop because the sun was rising and shining mercilessly above us. The water was wonderfully reviving however, and when we went on the men were singing and we felt more hopeful of arriving safely at the next water place, now only four dry marches ahead. We went on descending from this terrace of basalts and arrived on a

dry, white, dreary glassy plain occasionally fringed on the left side by low chalk cliffs. The chalk forming also the flat surface we were going on now was crystalline and shiny, not perfectly smooth, but blistered, cracked up, and crisped, like melon skins thrown and spread out haphazard. The blisters were often quite large and cracked, exposing small grottos which would have been sure nests to some small wild animal were these places habitable. Not even snakes or insects of any kind were found on these chalk plains, with lava flows mingling and succeeding one another, the lava as a rule more recent than the sedimentary deposits. This lack of all signs of animal or vegetable life had been characteristic of the country through which we had come ever since leaving the banks of the Awash at Aroberifaghe. We had gone for days at a stretch also without meeting any natives, for the few inhabitants of this desolate region kept to their small and treasured water-holes, and everything suggested that similar awful conditions were to be expected for the remaining half of Northern Danakil through which we had to pass.

We stopped about 10 a.m. in a hollow within basalts topping chalk. The water having eroded some of the older deposit had created a grotto. We were thus under a horizontal roof of 3-foot thickness and in complete shadow. The grotto, which became a tunnel, proved some 30 yards long, and was a great relief to us, as it was cool as compared even to the shadow at the mouth of the tunnel; besides the dimmed light inside offered some peace to our tired eyes. We spent three hours inside the tunnel, but at 4 p.m. were on the march again. This meant beginning loading at 2 p.m. in a temperature of nearly 170° F., which was always a sore trial, but now that the moon rose late and we were compelled to make forced marches, we had to travel twice in the twenty-four hours. So we moved off again in the torrid heat, descending gradually towards the immense cone Afdera, standing outlined as a grey blue mass against a glaring hazy sky of diffused yellowish incandescent light. The details, the ranges of hills at the foot, the crevices, ravines, etc., were absolutely lost in the foggy purple-grey haze. They were only visible in the morning and evening light.

We crossed great stretches of lava, some in blocks or flags 25 or 30 feet square, as smooth as the tar spread by brooms on road paving and reminding us of it, having the same dull blackness, and when these ended the rough, savage lava cracked, recracked and recemented, sharp-edged, and standing vertical for square miles around. The innumerable crevices, some deep and wide and sharply cut, were a danger to our beasts and ourselves and made us wish all the time for the clayey surfaces of the deserts of Aussa or the chalky though crisp surfaces of the last few days. But these white expanses were to come again in their turn too. Yet after sunset and when the light was failing we were unfortunate in having to go through the most broken ground imaginable. We walked between the walls of low, narrow cracks, between rows of columnar trachytes and basalts, climbed piles of hexagonal fragments (each stone several cubic feet in volume), of broken columns, of masses of volcanic rock, because no outlet was to be found otherwise; descended hollows, and then climbed again. It was an infernal place, especially for our groaning camels who had to be coaxed ahead. It was getting dark when we descended at last into the great Afdera plain. It was sandy and a relief after the rocks which for most of the day had tried us.

The silhouette, now pitch black, of the Afdera was before us and stretching as far as the eye could see to the left and right. We turned to the right and went on till 8 p.m. to find, in the locality of Realu, the few scraggy, spiky bushes we had seen from the top of the lava terraces before sunset, which would provide some food for our camels.

The march had been hot, and the night did not cool down till after 2 a.m. We left again in the early morning; as the moon rose, loading began and we were

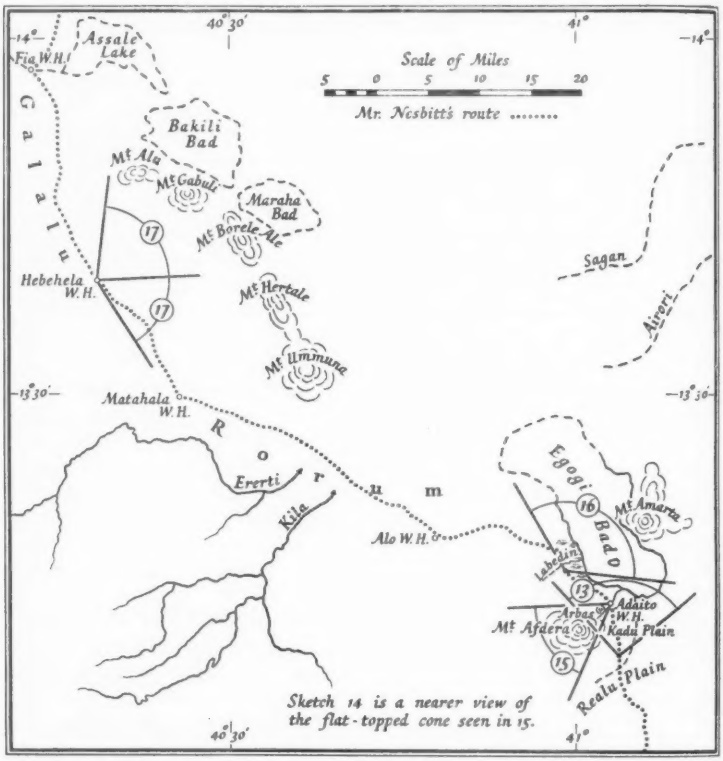


Diagram showing the points from which the third set of Mr. Nesbitt's sketches were made, and their range

off at 4.30 a.m., marching parallel to the mountain slope (Sketch No. 13). The plain showed hard woody grass and a few low stunted palms of a worthless kind. We had in a certain measure modified our route, hoping to have found water at a certain spot on the plain, but we met a native who told us there was no water, and when we arrived there, though two natives and a couple of camels were seen, indicating the presence of something to drink not so far off, and we asked the natives to tell us where the water was, they refused to give or to sell us the information. They did the same about the sale of a

goat. But such things happen here. Our men had not been able to buy a goat or a sheep for quite some time. These Danakils refuse any sort of assistance when they feel that way, and would watch another man die without disturbing themselves in the least. So, though we had thought to stop here for the day, we had to move on in our exhausted condition, much discouraged.

We continued, and had not gone half an hour when the ground became so broken, the lava reset on edge, so rough, so sharp, so cutting that it was the worst we had yet seen and experienced. Cracks and hollows, pitfalls everywhere, a danger even to ourselves and much more so to the clumsy, flat, soft-footed desert animals. The lava seemed to be recent because not a sprig of vegetation was seen anywhere around, only flows and flows, in domes and hollows showing all the marks of the thick liquid as it flowed and solidified, with rippling in heavy curves and large flags, comparatively smooth on the protected side and blistered on the other, exposed one. One camel fell and had to be abandoned because nothing would have made him revive and he had gone unloaded for the last few days. The locality was known as Kadu.

We continued, the volcanic landscape now becoming less forbidding, and after a gulch at the foot of a very recent-looking, small, flat-topped volcanic cone, pitch black like a coal dump (see Sketches, Nos. 14 and 15), we entered a broader, salty valley of some 100 yards width, bordered by low chalky cliffs topped by the inevitable lava flows. In this valley of the Adaito torrent recent rain, probably of a day or so ago, had left a few holes of water, bitter and salty, but so welcome! So we stopped for the day at 8.30 a.m., intending to leave again that night with the moon.

In the early evening Pastori and I climbed a small lava flow and saw in its full pearly beauty the immense sheet of the Egogi Bad, or salt lake, bordered from east to north-east by the imposing Amarta cone. The lake was only about a mile east of us, while behind us was the ever-present Afdera cone. Later we caught in the small shallow pools some 4 lbs. of tiny, very spiky fish, which we ate with great pleasure, this being the first change from soup, rice, and macaroni, or *barguta* dipped in oil, that we had had for two weeks. I also shot several turtledoves and partridges, so we had meat also, and saved some for the next day and for our sick men. These sick men had found a series of hollows in a row under a small cliff: each hollow just enough to hold one man. Here they had made a sort of hospital, all stretched out in the hollows and shrouded in sheets, where they looked like martyrs freshly buried in a catacomb.

Next day, June 13, we left at 5 a.m., well stocked with water but trusting, according to our guide, to find more a little farther ahead. This new man, Assen, who had taken us along after Sunimaa assented to let us go forward, was by far the best guide we had met in these three months: quiet, willing, and helpful, unassuming, soft spoken, and modest, a treasure in such places as these, where the life of one and all rests on the goodwill and knowledge of a savage to lead the caravan after days of dry travel to a water-hole.

We now went north-west, keeping parallel to and some 2½ miles west of the lake shore, *i.e.* where the basalts and lava of the Afdera with the chalks died away in the dry wind-blown sands bordering the marshy fringe of the lake. It was a pleasure to see signs of vegetation on this marshy ground stretching north-west in the haze, also the lake surface in places silvery, in others foaming,

though known to us to be briny, undrinkable, and unfit for life. In the north, over the lake, we saw what looked like a small hill standing out against the sky. This, according to our guide and to other information, was an islet in the lake, on top of which he said ruined dwellings were still visible, habitation evidently abandoned as the lake water became saturated with salt (Sketch No. 16).

We were cheered by the sight of this immense stretch of water and by the fact that the ground we were to traverse and lying below us seemed fair, and indeed it proved very passable, though a little sandy and rocky in places. Another hour brought us to the outlet of a dry torrent, the Labedin. Never will I forget this spot, for here there were two wonderful large deep cool water-holes, hidden away in the basalt, a little above the sandy and rocky outlet. As in other instances, here, a few hundred yards upstream from the mouth, where the volcanic boulders still hung together, split but undivided in their hardness and grim aspect, in a hollow easily accessible even to animals, was a beautiful pool of clear sweet water. Some caverns on the sides, with their dark shadows, seemed to invite one, offering a refuge against the pitiless sun. We climbed higher up and found another and even larger water-hole. This was some 50 by 25 feet across and very deep. Our men kept to the lower one, ourselves to the upper. I took my crocodile up there for a day's treat, half sinking his kerosene tin into the tranquil water at the edge of the pool and through holes in the bottom the water kept circulating to a safe height for the happiness of my little Awash friend.

At 4 p.m. we left this place, with its abundant, perennial water, probably the first perennial met so far. All the animals had drunk, and every receptacle was filled, ready for five, or, if we were lucky, four marches without water, that is twenty or twenty-five hours in the desert. The road was fair, though sandy in places where sand had been blown by the winds in among the lavas and basalts. We skirted the last spurs of Mount Afdera, and followed the foot of new ranges also volcanic. A few tombs were seen, some well built and one having a bundle of sticks tied to a stone vertically placed, probably an offering to the dead.

We came across another lava field, cracked and set on edge. Here two camels fell and became wedged together, bursting some of the *girbas* they carried, a serious disaster as we were so far from the next water-hole. Assen however made us turn aside from our intended route in hope of finding a well at a spot called Alo which he dimly remembered when, fifteen years before, he had once travelled through the region. We proceeded in the new direction, fearing the worst, the desert wind adding to our trials and the fierce heat which only abated when night had fallen. In a depressed condition we reached Alo, where there was a group of scanty palms, but Assen was unable to find the water-hole that evening. To add to our troubles and fears during the night we were kept in a state of suspense and fear by cries and noises in the distance around us. Assen, catching a few words that were uttered, declared that they came from two columns of a raiding party who had become separated, and he recommended perfect silence on our part. Gradually the parties seemed to move off towards the south-east and then the cries ceased.

Next morning, when searching for the water-hole, we found an old man nearly dead with thirst, whom we revived. He told us that he had fled from his village with two others, a man and woman, to escape from a raiding party.

They had made for the desert, hoping to reach the small Alo water-hole and there wait until the danger was over, but he had become separated from his friends, none of them being able to find the hole. His two friends were never found, and we concluded that they must have died of thirst, as they were already in an exhausted condition when they reached the Alo locality.

The old man had been surprised at being followed by the raiding party into this desert region, but he and Assen now came to the conclusion that the raiders, having heard the *dago* or news of our approach, had probably planned to meet us either at Labedin, or in the desert on our way to the next water-hole. Our deviation to Alo had therefore saved us and they had evidently gone on to Labedin, so by marching on we would easily out-distance them. As we needed water for four dry marches however, we stayed at Alo till the afternoon, for the well, which Assen eventually found, his memory not having failed him, only gave water drop by drop. The hole was barely discernible, even a few feet from the narrow mouth, for it was sunk 12 feet down.

When we set out again we followed a course sometimes west but mainly north-west. The landscape had become monotonous after we left behind the last spurs of the Afdera system, when a group of good tombs were passed, one of a different design from those seen hitherto, being square instead of round, and the sides made of uneven vertical flags. We now marched on sand and lava, the latter almost covered in many places. Night came, and the dust in the air, owing to the constant afternoon and evening winds, made the starlight insufficient for our guides to keep in the right direction in this monotonous desert of sand and lava. So we camped after only two hours' march. Next morning, June 15, we proceeded quietly on the same monotonous alternation of basalt or lava outcrop and sand dune, or sand filling the hollows. When the sun rose an entirely new landscape was revealed to us. The big flat cone of Mount Ummuna was the prominent feature, to its right in the distance the cones of the Hertale volcanic group and from behind two small dead cones a line of smoke close to the mountain side rose from a long valley. This was the first of the four active volcanos in the group that we saw.

After a halt during the heat of the day, we camped that evening in the midst of the desert, but next morning soon passed out of the desert and grass began to appear. This improved as we approached a group of miserable matting huts which we could barely distinguish in the distance. Signs of cattle and camels and men greeted our eyes—a relief after four dry marches in the desert. As we drew near the natives, who had seen our camp fires the night before and had also been warned of our approach by the old man we had saved at Alo who had gone ahead, all came out to watch us. Had they not been informed of our friendly intentions they would have fled. The chief and a dozen men with rifles and spears came to meet us. The chief was blind in both eyes and rather aged, very quiet and modest in deportment. He greeted us, kissed our hands and gave us an *ascari* to show us a good camping spot near the water-hole. So we went ahead for another half-hour, and at 9 a.m. were at the locality called Marka near the water furrow of the same name. This was a very muddy ditch some 200 yards long, half dry and clayey, where cattle, goats, camels, sheep, and men all drink and bathe together: disgusting water, green, thick, and slimy, but not

salt, and a boon to us. The greenness and abundance of the pasture around surprised us very much. There were a few thorn trees of the usual small size in scattered patches, and under two of them we rigged our tent.

The procession of natives began almost immediately, starting with the blind chief and his followers. The usual prattle and parliamenteering took place, then goats, sheep, and milk appeared, presents from the chief; then the men began pressing their goat-skins for sale and the women theirs and sour milk, kid goats, grass ropes, and old baskets, begging for beads, tobacco, and other gifts in exchange. Later the big chief of the region arrived and offered us more goats and sheep (we already had six by now), and of course such presents meant gifts in return. Also we knew what happened when there was too much meat in camp. Our men ate beyond measure and got sick, and what was left alive was a bother to urge along with the caravan, and often caused loss of time through straying.

Early next morning the procession of local chiefs, beggars, and curious natives began again, and by six it was in full swing. They all begged for durra and tobacco. The tribes a little farther south will travel as far as Aussa to get durra, yet they will not cultivate any in their own territory. The natives where we now were go to the Italian Eritrea instead for their durra grain. Tobacco is the next great luxury. These people will not move out of the desert and settle in more peaceful surroundings and there cultivate the soil. They merely herd a few head of cattle, and own a few mats and a few goat-skins. The mats they spread over crossed semi-circles of split stick, and thus make a hut for themselves, of a very limited capacity, as two people can hardly sit on the ground inside. The goat-skins are for carrying water. They also wear goat-skins or pieces of boujadeete on their loins. They own a few rifles and lances and Danakil knives. Until a few years ago this tribe numbered some seven hundred people; now there are not fifty left, the rest having been killed in raids both of defence and attack.

We left Marka that evening with guides provided by the blind chief. After two hours' march through woody, hard grass, and broken ground, it became too dark to go farther, so we camped for the night. Next morning we continued among similar surroundings, passing through Tabena where there were many acres of very good hay. At 8 a.m. we came to a water-hole, which was unexpected, as we were figuring on four dry marches ahead. The water however was bad, so we hardly took any. For half an hour before this hole and for two after the ground surface was lava, with sand filling the hollows, but one could always manage a zigzag passage for the camels. We marched for five hours and then stopped for a rest when the heat became too great, leaving again at 4 p.m. We first went over desert clayey ground and later sand dunes with a bushy covering in places, camping on a steep sandhill slope, among a few scattered trees.

Next morning, June 19, after two hours' march we reached the water-hole Hebehela, a circular well only about as wide as a hat but some 10 feet deep which allowed a soapy water to percolate and little by little fill the bottom. This water-hole was near some doum palms amongst dunes which were sparsely covered with bushes but were much blown by the wind. The landscape around was attractive (Sketch No. 17), and the volcano on the Alu slope interesting

to watch. This morning it smoked from four vents, and looked as if a four-funnelled factory were being stoked there in the distance. The other cones were wonderful landmarks too, specially the Gabuli, a sort of Fuji Yama. On the opposite side of us, to the west, were the sharp-edged lines of parallel ranges of mountains, the beginning of the great Abyssinian plateau.

The following morning the caravan divided. Pastori and I with six men left at 6 a.m. and made for the lavas at the foot of the Hertale chain, intending to climb in the afternoon to the active volcanoes, while Rosina with the rest of the party went north to the next water-hole called Garibo. (He later went on to Mandelu, Garibo being dry.) Pastori and I traversed the desert in a north-easterly direction and stopped at the first lava flows at a place called Anfeitale, near some tombs, where a natural hollow, or rather half a dome left by the unfallen portion of an enormous blister, the broken main part lying in pieces in front, afforded us shelter from the sun. The view outside was good, the Hertale smoking in the distance and the several "factory chimneys" of Alu's side working away in full blast. But by 7 a.m. it was already hot and we were anxious for shade; we only delayed a quarter of an hour to have a shot at wild ostriches pasturing in the vicinity where some scanty forage was found. We also saw wild asses and zebras. At 4 p.m., leaving two men to guard our things and save some water for us on the morrow, we set off over the lava fields. The edge of these interminable spreads reached the desert; as sharp a line as could be demarcated bounded the whiteness of the barren clayey soil and the metallic blackness of the volcanic flow. The lava was broken, edgeways, full of crevices and pitfalls from a few inches across to gaps of often 2 yards' expanse, with sheer vertical sides, and 10 yards or so deep. These were difficult to manage, loaded as we were to capacity with water and a little food. We had a fine view of the Alu and Gabuli peaks and the smoking sulphur and endless lava fields. The lava took on all shapes: in places it was smooth for a few square yards, in others it had a surface like rough plaster; sometimes it looked like a series of ropes twisted together and set parallel, or heaped-up masses of twine, at others like great sheets dipped in tar thrown on the ground and evenly pushed into thousands of regular ridges.

We went on and on and as fast as we could because the way was long and we had to make the best of the few hours before sunset, but when this came we were yet at some distance from our goal. We made as much haste as we could, but were now confronted with reefs and hills covering very large areas of clinker just like that which forms dumps outside coal plants where it is burnt in quantities, though the pieces here were far larger. This proved the hardest ground to walk on, as it turned under one's foot, moved and broke. When it was too dark to continue we stopped, at about 8 p.m., and settled for the night in most uncomfortable surroundings, too tired even to eat. We had little rest on our rocky bed, and at the first signs of light rose and moved on towards the smoking craters, coming at last, after two hours' march, to their base. The sun was already getting strong, so after examining them, and taking a good look round we hurried away. We would have stayed longer if the thought of the increasing power of the sun, our small water supply, and the wind blowing towards us the sulphur from the burning deposits farther up the mountains and to our left, had not forced us to leave. We took a few photographs and then

departed. The return trip over the lava was terribly trying, but we at last reached the edge of the volcanic spread with feet, knees, and elbows bruised and bleeding. Unfortunately we had sent one of our men to tell the two others left at Anfeitale not to follow us, but to go straight to Garibo, where we had also thought of going direct, not realizing how long our detour would take. We went a little to the right near the lava edge to a water-hole in a hollow which our guide found out. It was only a narrow hole under an overhanging rim of broken lava and inside it descended steeply at 60° to some 30 feet down, where it enlarged and spread out. This water-hole is said to hold out for three and a half years, but we found no water in it, as it was over five years since any rain had fallen here. When rain does fall here it comes down in a deluge for a short while and then stops quite as suddenly. At the bottom of this well we only found mud, so thick and pasty that it was absolutely useless even to cool our hands in. So we set off again through the clayey desert and sand dunes, making for Garibo, only to find that well dry also. Footprints on the ground indicated the direction which our caravan had taken towards the next water-hole, so we followed these northward, but it was nearly noon before we got to Mandelu and there found our main body. We straggled in, exhausted with marching and from thirst, our water having given out three hours before. The muddy water of the furrow or pool at Mandelu proved a blessing; it was plentiful and though heavy and slimy the quantity compensated the quality. The pool was 8 inches deep and about 5 by 60 feet across, all mud at the edges.

We left at 5 a.m. next morning, June 22, and at 8 a.m. arrived at a group of palms called Waideddo, where a well exists. This, like others of its kind, was about 18 inches in diameter and about 16 feet deep, so a bucket could just be lowered by means of a rope. The water was mineralized very slightly and had at least the advantage of being clear, whereas that of the furrows and pools is a solution of slime. On the way, at Hararo, we had met a few natives who were friendly enough, as they sold us kid goats and douma or doum-palm wine. I saw the way they get this liquid, which is sweetish in the morning when collected but ferments very quickly, and in a few hours is quite acid. The palm trunk is cut to expose the core, on which an incision is made, and under this a sort of half spoon cut out of a palm leaf stem is held to guide the dripping liquid into a horn-shaped receptacle below, this being made of a palm leaf lance coiled up rather like the paper of a paper pencil. A hood of coarse matting protects the whole from the sun. Every morning the natives collect the liquid which has dripped in the twenty-four hours and cut just a thin slice off the top of the core to keep it fresh. So they go on for a week and then stop the tapping for fear of killing the palm trunk. They get a cupful a day out of every tap.

The surface of the ground near Waideddo was crisp with the salt exuded to the top through moisture or previous rains. In places it was white and looked like frost. The groups of doum palms, often twenty or thirty in number and quite large, with the new ones sprouting beneath, were the only picturesque features of this otherwise dull, flat, barren ground. Apart from the palms, which indicate the presence of water either at or below the surface, only a few bushes of a hard knotty kind, very low and almost leafless, enliven the landscape. We had seen no beasts of prey for weeks, and as to birds, they were only rarely

seen where the water was in pools or open water-holes. Here where it was deep down not a bird or wild animal was to be found, only a few wandering natives, with a few dozen goats with the prettiest spotted coats, black and white, black, red and white, spotted and marked, some minutely, some in large bold patches in innumerable designs.

We started again early next morning and at 8.30 a.m. arrived at Fia, where we found some fifty odd people, Danakils, who had come from the Assale salt plain. These had drunk the hole dry, so that we had to wait until more water percolated into it. Only after four hours' time did we manage to get a couple of *girbas* of water which we bought with durra from the people stationed at the hole. Fortunately we had not exhausted the supply we were carrying and thus could manage to wait and avoid trouble between our men and the Danakils.

The reason for this large party of Danakils camped at the hole was this: Danakil tribes living in the country adjacent to the enormous salt deposits of Assale used to have constant fights with the Indertas, who also had a claim on the salt exploiting, *i.e.* the making of the ***mollie*** or salt bars hewn in regular rectangular shape and size from the rocky salt layers, an ancient sea bed covering many square miles. As these fights meant much bloodshed, some local chiefs took the matter in hand and the Negus decided that the Danakils, being more numerous, should have the exploiting of the deposit for the whole month except for three days in which the Indertas were to go and work. So when for three days the Indertas came all Danakils evacuated and went away quite some distance either to the Italian territory or north or south and kept out of the way of the Indertas, who killed anybody on the salt deposit or even on the track leading to the working places. The Indertas if anything are less savage than the Danakils or Afars, but the race hatred accentuated by these salt rights had made these people such bitter enemies of one another that even now they looked for the slightest encroachment on their prerogatives as an excuse for widespread raiding. When we reached Fia the three days were due to end next day, and all Danakils would then be free to return to the Assale salt plain.

The *mollie*, as I have said, is hewn from the big flat rocks which constitute the uniform, perfectly level deposit of the salt plain over a depth of some 60 feet, and a surface of some 20 square miles. On the southern side this large barren white plain, full of cracks like those on dried mud or dry slacked lime, is bound by the Assale Bad or Assale lake near which we passed that morning, and whose water is salt saturated and contains no life in its bitter brines. There is a little islet in it and south of it still farther there is a small mountain range with a number of small but very symmetrical cones on its slopes. The inevitable lava field is the fringe joining these eminences to the sandy desert, but the dunes are low and proved manageable without great effort.

We left Fia at 5 a.m. next morning, going first over desert ground, salty and flat, and then pebbles and rounded stones stretching for many miles, the wide mouth of a series of torrents here dying out on the immense salt plain. In the distance was the dazzling light of the salt lakes and mirage effects reflecting the rare isolated mounds and hillocks as in a mirror. We arrived at a part of the plain where the ground was broken and covered with small dunes

cemented by salt and therefore hard. In the distance was the utter barrenness of the pebbly plain ahead, limited on the north and west by the Abyssinian plateau ranges. So we continued towards the first hills of the Abyssinian plateau to our north. The ground was literally covered with cobbles and pebbles and sloped upwards. We marched an hour and a half in the burning heat and arrived at the vertical cliffs of a canyon which once every four and five years when it rains contains a torrent in its narrows. We zigzagged down it and arrived at the bottom some 250 feet below. It was a narrow winding bed, between vertical sides, the ground being a mass of rounded river pebbles of very varying size and held in sand which under the great pressure above was as hard as sandstone. In places the vertical walls were so close together as barely to afford a passage to a loaded camel. We went about a mile upstream, along the dry torrent-bed, and found two dry water-holes, but luckily a little farther on we found one the size of a hand basin almost at the surface with a few pints of water in the bottom, clear and sweet. We dug about and got more water, and here we camped for the night, our last in full caravan.

We spent next day, June 25, here, where it was cool and pleasant, and then in the afternoon Rosina and I parted from the rest of the caravan, which, under Pastori, was now to make its way *via* Makalle back to Addis Ababa. Rosina and I, with three camels, continued along the torrent-bed, following its tortuous lines always between the vertical sides till these gradually decreasing in height brought us to the outlet and again into the sudden view of the infinite salt plain—a perfectly flat, boundless greyish expanse, an immense marble floor, in the distance snowy white. The only feature breaking the monotony on three sides of the plain was the salt hill of Dallol and the two or three isolated blocks of salt rising from the flat crispy parent beds. We travelled on straight for the two columns of Dallol, two great solitary pillars standing on that ancient dry sea floor. After crossing the grey portion we traversed the white. The former was partly salt and earth brought by the rare rains so mingled as to afford a safe footing because the salt retaining the moisture often made the ground very soft. The white portion instead, *i.e.* the salt proper contained beyond this rim of grey, was a spectacle to the eye. Pure snowy white salt like a solid sea, with the most attractive designs formed by the ridges and cracks.

We reached Dallol at 7 p.m. This low fortified hill looked like a mediaeval city with towers and ramparts, a most fantastic aspect so produced by the erosion of rain water, wind, and weathering in general. There a small settlement works at a potash mine and a motor lorry was ready to leave for Kulluli, the terminus of the Decauville railway (*i.e.* mining track and trams) from the coast. So we said good-bye to Pastori, who had accompanied us thus far, and made our way, by lorry and rail, to Mersa Fatima, on the Red Sea coast. This we reached on June 27. We next hired a native boat, a very small craft, and on July 4 Rosina and I reached Massana. Two days later I was lucky in finding a steamship calling at this port, and on July 19 I landed in Naples.

Note on Danakil Monuments to the Dead

Although throughout Danakil we saw no signs of permanent or substantially built dwellings, with the exception of a few circular rough dry-walled huts, *e.g.* the Sultan's residences in Aussa, the memorials to the dead were con-

spicuous and solidly built erections. Very often in rocky regions we passed or saw from a distance beacons or cairns, regularly constructed along a mountain ridge, standing out in silhouette against the sky. Or on the barren clay plains of Southern Danakil, where no stones were available, a mass of heavy branches of trees, brought from quite a distance, and set so as to form a skeleton cone, recorded a burial place of importance. In every instance the memorials were in the most desolate spots, preferable on stony eminences, isolated and scattered.

In Northern Danakil, where lavas and basalts offer plentiful supplies of rock, the tombs are most solidly built of stone, and are characterized by a dry walled enclosure. These tombs fall into three classes, according to the importance of the man buried beneath. Heroes and chiefs are commemorated by a massive circular wall of stones, some 30 or more feet in diameter, and 3 to 5 feet high, neatly built and vertical, and broken by a gap about 3 feet wide up to which the wall perceptibly rises. This gap forms an entrance to the enclosure, within which are one or more tall cones built of regular-sized cobbles, which form the tomb of the dead hero. Sometimes in front of the entrance a small dry stunted tree is planted and from its branches hang, or have been hung, the trophies of the dead man's victims, their skins or other parts of their bodies, or the hides of leopards or other ferocious animals (Sketch No. 18). Lesser heroes and fighters in general are commemorated by cairns evenly and conically built, or, in localities where the stone breaks with two parallel faces, striking circular turrets. These, sometimes 10 or 12 feet high, are most regularly built, gradually tapering, though always keeping a circular section, from a varying base to a slightly smaller flat top, whereon are set on edge one or two sharp stones (Sketch No. 19). Sometimes these turrets, resembling beacons, are built of alternating bands of black and white stone. Others are spiral in design, and in all cases they are carefully built in spite of the roughness of the material used. These cairns and turrets are often built in groups, generally not more than ten or twelve together, though at Alo, in June, I saw one group of about sixty. The monuments to great heroes and chiefs, on the other hand, are always isolated.

The third class of memorial is that erected to ordinary men, a low ring of cobbles 3 to 6 feet in diameter, rather like the stone border of a flower-bed. Occasionally a diminutive cone is placed in the centre. This type of memorial is generally seen in groups of a few together. The skeleton cones, made of branches of trees, were usually also surrounded by a small circular enclosure, in this case built up as a fence of dry wood. Sometimes, leading up to the entrance to the enclosure round the tomb of a hero fallen in battle, there is a line of fairly large rough stones set on edge, and if they are very numerous, they are set out in two parallel rows a couple of feet apart, each stone denoting a victim to the credit of the hero buried below. With one exception only, all the monuments we saw in our three and a half months' travel in Danakil were circular in design, in accordance with the prevailing habit among the Abyssinians, whether constructing a hut, tomb, or cattle enclosure. The only example of a rectangular construction was at one tomb among the group of sixty seen near Alo.

REVIEWS

AYUNTAMIENTO DE MADRID: Información sobre la Ciudad, Año 1929. *Madrid* 1929. 13×10 *inches;* xiv+192 *pages; illustrations and maps*

This quarto volume, handsomely illustrated with ground and air photographs, maps, plans, and diagrams, was intended in the first place to give to competitors presenting plans for the development of the Outer Circle of Madrid a clear view of the existing city and its environs. The historical sketch of the city's growth and the account of the public utility services will interest a much wider public. How rapid this growth has been since the middle of last century and how far-seeing are the authorities of to-day is made strikingly evident by the statement that the Lozoya water company, which began, in 1857, to supply water to a city with one-third of the present population, is arranging now for the supply of a Greater Madrid of from two to two-and-a-half million consumers.

The information is all up to date, and even a little more, since it includes an advance draft of the revised sheet of the geological map. Unfortunately the statistics show the marks of hasty compilation, even the longitude of Madrid being incorrectly stated.

LITHUANIA 1928. Edited and compiled by E. J. HARRISON. *London: Hazell, Watson and Viney* 1928. 8×5 *inches;* xvi+384 *pages; illustrations and map.* 4*s*

This volume supplies, as claimed in its preface, a more reliable and complete summary of up-to-date information on the subject of the Lithuanian republic than can so far be found elsewhere. In form it is compact and portable; its usefulness moreover is not confined merely to providing information, for it raises many larger questions and, by suggesting available literature, opens up various lines of more precise inquiry leading out from the central subject.

Part I is divided into six sections and contains useful facts relating to the country. The first gives a brief account of the Government and its personnel, statistics as to size and population, outstanding data as to foreign trade, finance and currency. The next explains historical and ethnographical boundaries, enumerating the chief geographical and topographical features, the most important of these being the river Niemen (Nemunas) with a navigable course of 892 kilometres and on which both Kaunas and Wilno are situated; the lakes, numbering about two thousand; forests covering about 19 per cent. of the entire country; and the later acquired coastal district. The climate, towards the east increasingly continental, is tempered on the west by Baltic influence so that Klaipeda, as an ice-free port, attains considerable significance. The third section is historical, the fourth gives a concise account of present-day conditions, social and political, the fifth details cultural progress, while the sixth gives a full and clear economic survey.

Part II is called a reference section and contains a chronological list of the most important events that led up to Lithuanian independence, lists of recent cabinets and parties, of political officials and diplomatic representatives. A Lithuanian "Who's Who" and many other useful sets of statistics are appended.

The importance of such a work as this lies in its suggestiveness. Students of politics are reminded that the political well-being of these small states affects definitely the equilibrium of Europe. Commenting on the Cabinet's Declaration to the Seimas in February 1927, the author outlines the present policy as leading up ultimately to neutralization, pointing out however that difficulties have still to be faced, for, in Lithuanian eyes, the Wilno problem still clouds the whole political horizon.

In the interesting historical sketch the attention of etymologists is drawn to the fact that, since the unfortunate extinction of the Prussian language, the Lithuanian group of the Indo-European family stands alone as still retaining a few words of the parent Sanskrit. It has even been said that "who wants to study the origins of our tongue should listen to Lithuanian peasants talking." The writer further shows, both by description and illustration, the versatility of Lithuanian literary and artistic genius.

The map and index are valuable additions to the book. E. G. W.

EARLY TRAVELLERS IN THE ALPS. By G. R. DE BEER. *London: Sidgwick and Jackson* 1930. 9×6 *inches;* xx+204 *pages; facsimile illustrations.* 10*s* 6*d*

The author, a Fellow of Merton, is no mere book-maker, but writes with an intimate knowledge of his subject. He has not been content to borrow from previous general works on Alpine travel (though he acknowledges a certain indebtedness to these) but has gone for the most part to the original authorities even when such are by no means generally accessible. A further advantage is his wide personal knowledge of the Swiss mountains. The result is an attractive book which, while making no attempt to vie with more elaborate histories, well fulfils its object of presenting a picture in outline of what touring in the Central Alps was like in early days. Incidentally it enables the reader to trace the gradual change of view from one which regarded the mountains as something harsh and terrifying to that which found in them an object of scientific study or a thing of beauty to be enjoyed for its own sake. A brief but instructive sketch of the changing political background and conditions of travel in early days helps to place the story in its proper setting.

The travellers dealt with range from early chroniclers like Stumpf, Tchudi, Münster, and Merian, and tourists in the more ordinary sense or mere birds of passage like Coryatt, Burnet, Coxe, and Wordsworth, to scientists such as Gesner, Scheuchzer, De Luc, Gruner, and, greatest of all, De Saussure. In a book of 200 pages one cannot look for much detail, and we are sometimes rather breathlessly hurried from one name to another. But a judicious selection of extracts enables the author to bring out something of the characters and aims of each, and many quaint incidents enliven his pages. We are told of Stumpf's many halts for a drink, of the legends connected with Mount Pilatus, of the common belief in dragons in which so late a writer as Scheuchzer shared to some extent, and of the rules laid down for the use of the baths, including a qualified licence to those troubled with "an irresistible desire to sing in their bath." The well-chosen illustrations reproduced from old books (among which Merian's and Scheuchzer's are largely drawn upon) are an attractive feature, and there is a useful bibliography. Although this is not intended to be at all exhaustive, we miss one or two works which we might have expected to find, *e.g.* Scheffer's important history of Alpine Communications, the most surprising omission being perhaps that of any reference to Mr. Freshfield's standard life of De Saussure.

JAPAN IN THE WORLD OF TO-DAY. By ARTHUR J. BROWN. *London: Williams and Norgate* 1930. 10×6 *inches;* 322 *pages; and illustrations.* 12*s* 6*d*

To assess this book at its proper value as a picture of Japan as the author sees it to-day one has to remember that it is written by an American for the American public. This fact serves to explain why so little is said of the part played by European peoples—particularly the British—in the changes that have taken place in the re-formation of so much of the political and social life of modern Japan. At the same time, however, the writer does not spare frank criticism of the treat-

ment of many Japanese immigrants engaged in entirely lawful industries in the United States, more particularly in those of the "Pacific Slope."

Several of the chapters in the book are of considerable interest, although the information is at times rather out of date, the work being partly a résumé of articles published elsewhere, some in an earlier work by the same author, as far back as ten years ago. Observations on the educational system and on the discipline of the Japanese schools are interesting and informative, as are the chapters dealing with the organization and the spirit of the Japanese Army and Navy of to-day.

There are, however, many misprints and inaccuracies of statement. On p. 73, for "Emperor" we should read "Shogun." There is no "huge figure" of the Buddha as tall as 145 feet nor indeed of half that height (p. 254). The depth of the famous Kegon waterfall is not more than half the 600 feet here credited to it (p. 120), nor were there at the outside more than one-tenth of the " 248 suicides there in 1912" as stated in the text. The statement (p. 65) that "the Genro as an institution is apparently passing into history" is one which will be seriously challenged by many of the more thoughtful Japanese writers of to-day, as is clearly shown by Dr. S. Washio in a special article on the subject, published in April 1930 in the *Trans-Pacific* of Tokyo.

We ought not, however, to fail to thank Mr. Brown for his mention of the fox-shrines to be found to-day in the yards of some of the large modern factories in Osaka, the Manchester of Japan. The "fox goddess" is here regarded as the guardian divinity of such establishments, and not only does the owner of a factory often worship at the shrine, but annual festivals are held thereat for the work-people and their families. W. W.

ACROSS THE KALAHARI DESERT. By W. J. MAKIN. *London: Arrowsmith* 1929. 9×6 *inches;* 288 *pages; sketch-map and illustrations.* 15*s*

This is an entertaining account of the expedition which under Captain B. E. H. Clifford crossed the Kalahari in 1928, using motor lorries (see *G.J.* 73, 1929, pp. 342–358). The party first went west for 400 miles through the southern and practically waterless part of the Kalahari and thence north by Ngami to the Zambezi at the Victoria Falls. Mr. Makin tells of the hardships endured and of the natives met—Bushmen and Bechuana, including the Bakalahari (whom he calls Bakalahadi—but that may be a misprint). He also gives graphic pen-pictures of the isolated white farmers, traders, and officials he and his companions encountered, and tells something of the strange lives they lead. This is one of the most valuable parts of the book. An occasional looseness of expression may be noted: for example it is incorrect to speak of "British Bechuanaland," as the author does several times, when he means the Bechuanaland Protectorate. And the information about Ngami which is not from personal observation, should be read with caution. "Some years ago," says the author, the Ngami area "was one vast sheet of water, a bigger lake than Tanganyika or Victoria Nyanza." The passage about the discovery of Ngami also needs revision; the part that that fine sportsman William Oswell and his companion Murray played in the first visit of white men to the lake is stated by Livingstone with complete accuracy in his 'Missionary Travels.' Mr. Makin's further statement that "in editing Livingstone's book [Oswell] deleted all references to himself" is obviously absurd. There are some excellent illustrations and a sketch-map of sorts, but there is no index. F. R. C.

MODERN CANADA. By HARPER CORY. *London: William Heinemann* 1930. 9×6 *inches;* xvi+290 *pages; illustrations, diagrams, and maps.* 10*s* 6*d*

Some years ago Sir John Foster Fraser published a book on Modern Canada which gave a most vivid picture of this great Dominion. There were very few statistics but many delightful descriptions. Mr. Harper Cory, himself a Canadian who is desirous of removing "the many mistaken ideas regarding Canada in Great Britain," gives no personal impressions but pages of statistics which "to ensure the greatest accuracy" are all drawn "from Government sources." The result is a compendium on the geology, physical features, climate, population, resources, constitution, industry, trade and commerce of Canada which should supply the Britisher with all the information he requires. The book however is not one to be read but rather to be consulted for any facts that may be required. The illustrations are good and some of them, such as that of the Government elevator at Saskatoon, most interesting. On the other hand the portrait of Champlain has been shown to be that of some one else and the advertisement of the International Harvester Company at Hamilton gives an erroneous picture of that Ontario town.

In reducing his statistics wherever possible to diagrams the author has helped the reader greatly. Of these diagrams he has moreover not been sparing, and they form one of the best features of the book. His weak point is history, and some of his statements are pure fantasy. It is not true, for instance, that when John Cabot in 1497 (not 1498) reached Newfoundland "A host of European fishermen had preceded him": for he was the real discoverer of North America and his title to fame is second only to that of Columbus. It is also incorrect to say that before Cartier's time "many of the fishermen had made a practice of spending the winter upon the mainland." One wonders whence the author drew these fairy tales. No fishermen ever spent the winter in Canada, where the first winter settlement was that of Chauvin (not Dupont-Gravé) in 1599. The first permanent settlement dated from 1604 (not 1605). Certainly the author found none of these statements in the only History of Canada that he mentions.

The statistical information is of course the great asset of such a publication. and of this there is a plentiful supply. It seems indeed to cover every conceivable field down to Civil Aviation and the "Recreational Resources" now looked upon perhaps as Canada's most rapidly growing "Industry." Information is also supplied upon matters connected with the tariff, which has been corrected to as late a date as 1 February 1929.

The final sixty odd pages are devoted to a detailed account of the nine Canadian provinces, as well as the Yukon and the North-West Territories. Information is given upon the area, climate, population, education, agriculture, dairying, forestry, fisheries, and manufactures of each, as well as on the judiciary, the legislature, and other matters of government.

Mr. Cory has obviously gone to great trouble to obtain the latest and most accurate information available, and his book should do much to fulfil the purpose for which it has been written. Had he been as careful over his historical facts as over his statistics he would have produced a first-class work. On p. 101 *Couriers des Bois* should be *coureurs de bois.* H. P. B

THE WINTERING PARTNERS ON PEACE RIVER, from the earliest Records to the Union in 1821. By J. N. WALLACE. With a Summary of the *Dunvegan Journal,* 1806. *Ottawa: Thorburn and Abbott* (*Edinburgh: John Grant*) 1929. 9×6 *inches;* 140 *pages; and map.* 9*s*

The North-West Company was one of several companies which were formed to exploit the fur trade of Canada, after the British had taken possession of the country. The partners of this company were divided into two classes: those who

lived in Montreal and those who organized the trade with the Indians in the West. The latter were full partners in the company, and, as they lived in the Indian country during the whole of the winter, were known as the Wintering Partners. Mr. Wallace has written an historical account of the exploration and settlement accomplished by the wintering partners of the North-West Company in the Peace river basin between the years 1776 and 1820. In 1788 there was only one trading post on Peace river, but by 1802 the number had increased to nine. Mr. Wallace has identified the sites of the posts and illustrates his conclusions with a useful map. He has included extracts from a diary which describes the foundation of Dunvegan, one of the trading posts on Peace river. The Hudson's Bay Company eventually entered the Peace river country to compete for trade with the North-West Company. The rivalry between the two companies, of which the author gives an account, ended in 1821, when they were amalgamated.

References to numerous authorities are given, but the absence of a detailed bibliography is to be regretted. E. W. G.

GEOGRAPHIE UNIVERSELLE. Tome X. Océanie, by P. PRIVAT-DESCHANEL, and Régions Polaires Australes, by M. ZIMMERMAN. *Paris: A. Colin* 1930. 11×7 *inches;* 368 *pages; maps and illustrations.* 90 *fr.*

With this volume about half the fifteen volumes of the great geography planned by Vidal de la Blache and L. Gallois are published. Authors and publishers alike are to be congratulated on the steady flow of volumes of this important work. The greater part of the present volume is occupied by Australia, New Zealand, and the Pacific. No aspect of their geography is neglected. The physical chapters in each section are concise but adequate and prepare the way for excellent accounts of vegetation, animal life, and races of man. Then follow an admirable regional survey and discussions of problems in human and political geography. The treatment of such questions as Australian immigration, the white Australia policy, and relations between Australia and Great Britain show width of outlook and freedom from any bias. The bibliographies to this part of the volume are excellent and omit practically no work of outstanding importance. About seventy pages are devoted to a study of south polar regions. An account of Antarctic exploration is followed by a chapter on Antarctic seas. Then comes a study of Antarctica which is mainly glaciological, and finally there is a short regional study of various parts. The chief problems are well treated and the result is a balanced view of our present knowledge of the Antarctic which of course brings into relief the many problems that still await solution. In such a work as this more space might profitably be devoted to whaling in the southern ocean. One other word of criticism: the Antarctic bibliographies need to be revised and brought up to date in several places. The maps and illustrations in both sections of the volume are admirable and the full index is a great help. R. N. R. B.

GREENLAND. Published by the Commission for the Direction of the Geological and Geographical Investigations in Greenland. Edited by M. VAHL, G. C. AMDRUP, L. BOBÉ, and A. S. JENSEN. Vol. III. The Colonization of Greenland and its History until 1929. *Copenhagen: C. A. Reitzel* (*London: Humphrey Milford*) 1929. 11×7 *inches;* 468 *pages; illustrations and maps.* 35*s*

The great work on Greenland published by the Greenland Commission is completed with this volume (see also *G.J.*, 72, 1928, p. 484, and 74, 1929, pp. 492–493). There are few lands in any part of the world on which more detailed and recent information is now available in a single monograph. This final volume deals mainly with the trade and administration of modern Greenland, that is to

say from the eighteenth century to the present day. The status of Greenland in international law is discussed by Mr. G. Rasmussen. This is followed by long chapters on trade and administration by Mr. H. Lindow, the history of trade until 1870 by Dr. L. Bobé, and from 1870 until the present day by the Rev. H. Ostermann. These chapters are of particular interest as they trace the changing policy of Denmark toward Greenland. Full appreciation is given to the far-sighted endeavours of Dr. H. Rink, whose work lies at the base of the modern movement for the betterment of the Greenlanders' conditions. This section contains some useful statistics of Greenland trade. The cryolite mining, which is the only activity outside the state monopoly of the Royal Greenland Trading Company, is described in a separate chapter by Professor O. B. Böggild. Admiral T. V. Garde writes on the navigation of Greenland waters. Missionary enterprise in Greenland from the days of Egede and his Danish mission and the work of the Moravian Brethren to the modern church is traced in several chapters, and then follow others on the educational system and on sanitation and health. Compulsory education is now in force and there are nearly three thousand children attending school. They learn reading, writing, and arithmetic, and about half the number have instruction in history and geography also and rather fewer in natural history. The teachers are Greenlanders trained at a college at Godthaab. Two secondary schools have now been founded with Danish principals. The birth rate among both Eskimo and Greenlanders is high, 36·5 per mille, and the death rate is about 33, fatal accidents being frequent. Every chapter of the book has many references which are naturally in the main to Danish works. There are full geographical and personal indexes and an etymological glossary. A coloured map on a scale of 1 : 4,000,000 is added. R. N. R. B.

WEATHER: Practical, Dramatic, and Spectacular Facts about a Little-Studied Subject. By E. E. Free and Travis Hoke. With Maps and Drawings by Elsie Seeds. *London: Constable & Co.* 1929. 9×6 *inches;* 338 *pages; illustrations and maps.* 14*s*

The avowed aim of this book is to instruct the American public on lines dictated by previous inquiry as to its needs. The popular, not to say flippant, style of the book may not commend it to serious students of meteorology; but it undoubtedly succeeds from an educational point of view in as much as general principles are given in an entertaining manner likely to linger in the memory of the average reader and to stimulate his appetite for further study. On the whole facts are fairly accurately stated, whilst explanations, when the character of the work is borne in mind, are not at all bad. Exception however must be taken to the chapter on dew which is very faulty and needs recasting. The titles of such chapters as "The Weather Man's Job," "Lightning's Mysteries," "Secrets of Hail," "Cyclonic Powerhouses," "Weather's Radio Voice," "Wall Street Weather," may suggest the general tenor of the book. The chapter on "Rainbow Surprises" is a vigorous protest against too idealized a representation of the rainbow, ignoring its variations. In the chapter on "Snowflakes and Blizzards" there is a striking account of the great New York blizzard of March 1888—a month of heavy snowfall in Europe, 3 feet of snow falling even on the Riviera.

It is somewhat inconsistent after the graphic account of what snow in large quantities means in holding up communication and suspending the life of cities, to be told in a following chapter on the "Menace of Fog" that fog is the one weather enemy that man has not learned how to overcome. There is some misconception about the origin and distinctive nature of London and other city fogs. True fog in the meteorological sense, that is a saturated cloud resting on the ground and limiting vision to a few yards, is more of a country than a town phenomenon.

London still suffers from overlying smoke hazes, but true fogs in the close-built well-drained central area are becoming rather rare.

In the chapter on "The World's Climates" we are told that climate is inevitably the background in the mental pictures we form of different countries. Thus the Congo means "heat," Siberia "cold," Spain conjures up "a blaze of sunlight," and Greenland a " sheet of snow," whilst England is placed in the same company as the proud representative of rain. Climates like that of California, Florida, and the Riviera, say the authors, are neither especially beautiful nor especially healthy; and they say quite bluntly that those climates prove attractive to rich people and to lazy people because their "comfort-index" is high. With the contention that beauty as properly understood is most fully revealed in sterner climes where skies can frown as well as smile the present writer heartily agrees. The authors wind up with an account of the impostures of Rain-makers and other cranks.

The work is well illustrated; the frontispiece showing the Schneekoppe in the Riesengebirge under frozen fog being particularly fine. L. C. W. B.

THE REPRESENTATION OF GLACIATED REGIONS ON MAPS OF THE SURVEY OF INDIA. By MAJOR KENNETH MASON. Survey of India Professional Paper No. 25. *Dehra Dun: Geodetic Branch, Survey of India* 1929. 10 × 6 *inches; 18 pages; illustrations and diagrams.* 8 *annas or* 10*d*

Up to the present the accurate delineation of features above the snow-line has not been included in the maps issued by the Survey of India, indeed in the fifties and sixties of last century the surveyors were expressly told "not to waste their time surveying barren regions above 15,000 feet." In 1905 Mr. Douglas Freshfield on behalf of the *Commission International des Glaciers* drew the attention of Lieut.-Col. S. G. Burrard, Superintendent of Trigonometrical Surveys, to the importance of recording data for determining the secular movements of the principal Himalayan glaciers. The Board of Scientific Advice to whom the matter was referred agreed on a system of observation and recommended that the collection of data should be placed under the control of the Geological Survey Department. Between 1907 and 1910 observations and plane table plans for determining their secular oscillations were made by competent officers of the Geological Survey on fourteen glaciers extending from the far North-West in Kashmir through Lahul and Kumaun eastwards to the Zemu and Alukthang glaciers in Sikkim. Major Kenneth Mason tells us that there is to-day a feeling on the part of several officers of the Survey of India that the representation of glacier-features on the maps does not meet the requirements of modern science, especially in view of the fact that several important trade-routes traverse glaciers and pass above the snow-line. In view of the training of surveyors in the future Major Mason has drawn up in his modest paper of eighteen pages a series of notes on the characteristics and variations of glaciers, together with a discussion of the symbols that have been designed for their features with special reference to Himalayan conditions. The paper also contains a glossary of glacial terms. In future the maps in the case of the more important glaciated regions will show contours across the ice, the general glacial features and moraines, and the limits of permanent ice and snow. The instructions have been carefully drawn up after consultation with Lieut.-Col. H. T. Morshead and Major C. G. Lewis and officers of the Geological Survey.

The paper is illustrated by two photographs of Himalayan glaciers and by sketch-plans and sections of an ideal glacier, while Major Lewis has contributed a sketch of a specimen glacier giving the symbols that will henceforth be used on the maps of the Indian Survey. The paper contains an interesting note on the authority of Mr. Rickmers stating that exact measurements from photogram-

metric material show that the Fedchenko glacier has a length of 77 kilometres, thus becoming the longest glacier outside sub-polar regions. We congratulate the officers of the Survey of India on their determination to undertake this important work. E. J. G.

UNION GÉOGRAPHIQUE INTERNATIONALE. Second report of the Commission on Pliocene and Pleistocene Terraces. Edited by K. S. SANDFORD. *Florence: Bureau du Secrétaire Général* 1930. 10 × 6 *inches; 130 pages; illustrations and maps. 2s 6d*

More than five-sixths of this pamphlet is occupied by the communications submitted to the Commission at the meeting of the International Geographical Congress at Cambridge in 1928. The first part, consisting only of eighteen pages, runs some risk of being overlooked. With its dates and uninviting headings it has a ceremonial appearance, and the reader may dismiss it as merely a formal record of proceedings at meetings. If however he has any thought of working at the subject with which the Commission deals, he should not neglect the report presented to the Congress by the members of the Commission who were present (pp. 8–12). In the communications already published the Commission found, as might be expected, great heterogeneity of character and diversity of method. Since the purpose of the Commission is the comparison and coordination of observations in different regions, there should at least be agreement as to the meaning of terms and as to the points on which information is especially desired. For combined work to be successful it is necessary that the workers should be working at the same problem, or the same limited set of problems. In this report, accordingly, the Commission defines the most important terms, indicates the nature of the observations required, and states the main and subsidiary problems with which it is concerned. Also, as is emphasized in the Editor's introduction, it resolved that in whatever language a communication to the Commission may be written it must be accompanied by a résumé in either French or English.

The communications contained in this pamphlet show all the heterogeneity that the Commission had observed in those previously published. They differ in size, in the extent of country covered, in the nature of the observations and in quality. No general statements can be made about them, no general conclusions drawn from them. They are, in fact, pieces of a puzzle which will not fit till the remaining pieces have been found. They are grouped in sets, according to the region they deal with; and only in the case of Spain is there any approach to coordination. It is appropriate that an article by Professor E. Hernández-Pacheco, the President of the Commission, on the movements and deposits of the coast of Spain is one of the most interesting.

For the convenience of the reader a few changes in arrangement might usefully be made in future reports. An index is perhaps hardly necessary, but the reader would be saved much trouble if a table of contents were prefixed and the list of papers, which now appears at the somewhat exasperating position of p. 19, incorporated in it. The plates and figures of each paper are numbered independently and one of the folding maps has no number at all. It would certainly be more convenient if the numbers ran consecutively, and a list were placed with the table of contents.

Two misprints in the English section may be noted as likely to cause some trouble to a foreign reader, though not to an English one. On p. 93, footnote 2, "Crossness" presumably means "Cromer." On p. 99, footnote 1, "Geol. Journ." should read "Geog. Journ."

The Report is priced at 2*s*. 6*d*. until the Paris meeting of the International Geographical Congress, when copies will be issued free to all members of the Con-

gress. Copies may at present be obtained from the Secretary of the Commission, Dr. K. S. Sandford, University Museum, Oxford, England, but after December 1 he will be abroad for some time; and copies can be obtained from Cav. Dr. Filippo De Filippi, 8, Via Cesare Battisti, Firenze, Italy. P. L.

THE CAMBRIDGE ANCIENT HISTORY. Vol. VII. The Hellenistic Monarchies and the Rise of Rome. Edited by S. A. Cook, F. E. Adcock, and M. P. Charlesworth. *Cambridge: At the University Press* 1928. 10×7 *inches;* xxxii+988 *pages; and maps.* 37*s* 6*d*

This bulky volume, running to nearly a thousand pages, takes the reader from the Greek to the Roman world. The rise of Rome and the history of the Republic down to the end of the first Punic War forms the core of the book. This is introduced by a very candid critical examination of the sources of Early Roman History which must have a sobering effect on the mind of the historical student. The volume however contains much more than this. In a series of chapters the events following the break-up of Alexander's Empire in Syria and the East, in Egypt, Macedonia, and Greece are described. The philosophies of Athens, the Literature of Alexandria, and Hellenistic Mathematics and Science are discussed in a clear and interesting manner, notwithstanding the restricted space necessarily allotted to them.

The subjects more particularly interesting to the geographer that emerge are the migrations and movements of peoples. There are two notable examples, viz. the Celts and the Carthaginians. In a chapter entitled "The Coming of the Celts," Mr. De Navarro endeavours to determine their early home and early migrations by the study of the archaeological evidence (on which we are almost wholly dependent) as shown by the distribution of the Hallstatt and La Tène cultures. The evidence of place and river names points to their early home having been east of the Rhine, whence they entered and occupied Eastern Gaul. In the sixth century a great Celtic migration took place from the Lower Rhine to South-West France. Some of these migrants crossed the Pyrenees into Spain and occupied the central highlands and west of the Peninsula. Here they developed a culture of their own known as Celto-Iberian. The causes of these early migrations are largely a matter of conjecture. They have been attributed to pressure due to Teutonic expansion from the north into North-West Germany forcing the Celts west and south. Possibly one cause was geographical, a change of climate, with a great increase in rainfall, *c.* 850 B.C. and *c.* 500 B.C. In the later La Tène period these Teutonic intruders mingling with the Celts produced the Belgic peoples who, moving westward, overthrew the Celtic civilization of Eastern Gaul and in the last century B.C. penetrated into the British Isles. The migration of Celts into Italy occurred *c.* 400 B.C., and in the succeeding century Northern Italy was gradually occupied by them. This much is clear, but when we come to inquire as to the centre from which they came, and the route by which they crossed the Alps, we are in the region of doubt. It is uncertain whether they came from the Rhine region or from Gaul, and by what pass or passes they crossed the mountain barrier. Supported by archaeological evidence, Mr. De Navarro favours the Brenner pass.

In the later part of the third century B.C. there was a South-Eastern Migration. In 279 B.C. Celtic tribes entered Macedonia, and later under Brennus attacked Delphi. They were defeated and dispersed; some of them reaching the Straits crossed into Asia Minor. Other tribes, which had separated from Brennus before his invasion, going south reached the sea at Byzantium and crossed the Bosphorus. These entered the service of Nicomedes and Mithridates by whom they were later settled in a region of Northern Phrygia, afterwards known as Galatia.

Early in the sixth century B.C. the Carthaginians entered Southern Spain, overthrew the Tartessian Empire and occupied the southern part of the Peninsula. Tartessus was destroyed and the Carthaginians obtained a monopoly of the tin trade formerly enjoyed by the Tartessians. They closed the Straits of Gibraltar, thus cutting off the Greeks, and later the Romans, from the Atlantic and inhibited their trading with the southern coast of Spain. Having a monopoly of the Atlantic, daring explorers appeared, Hanno to the south along the African coast, Himilco to the north to the tin countries. Curiously enough for some unknown reason an exception must have been made in the case of the Massiliote Pytheas, who is believed to have started on his celebrated voyage *c.* 320 B.C. Thus cut off from reaching the sources of tin by sea the Massiliotas opened up a land route across Gaul from the Loire and Seine. There can be no doubt that both Tartessian and Carthaginian mariners made many voyages north, exploring the coasts and islands of the western seaboard of Europe. One fact alone, the fame of Tartessian bronze, is sufficient to show how important was the exploitation of the tin mines of Spain, Brittany, and Cornwall.

That perennial subject, the origin and migration of the Etruscans, crops up again in this volume. A writer in an earlier volume favoured the story of Herodotus that they were originally migrants from Lydia in Asia Minor. In his chapter on "The Kings of Rome" Mr. Hugh Last expresses a different opinion. He considers that the theory of Herodotus receives no support from either archaeology or language. "It is true," he remarks, "that the Etruscan population contained a section . . . distinct from the Italian Villanovans; but this section, whose own language is what we call Etruscan, is probably to be regarded as descended from the neolithic inhabitants of Italy."

As usual there are detailed bibliographies and a full index. The reader is assisted by fourteen very clear outline maps. There is only one small criticism to be made regarding these, that in some of them details mentioned in the text are not inserted. The pleasure in reading the book would have been enhanced if the Cambridge Press had used a heavier face. E. A. P.

LE HISTORIE DELLA VITA E DEI FATTI DI CRISTOFORO COLOMBO. Per D. FERNANDO COLOMBO SUO FIGLIO. Edited by RINALDO CADDEO. 2 vols. (Viaggi e Scoperte di Navigatori ed Esploratori Italiani, Nos. 11 and 12.) *Milano: Edizione "Alpes"* 1930. 8×6 *inches;* lxxxvii+316 *and* 386 *pages; illustrations and maps.* 18 *lire each*

These two volumes are a most welcome addition to the series in which they are included. The Italian text of the 'Historie' has hitherto been readily available only in the somewhat unsatisfactory edition published in London in 1867, since which date it had not been reprinted, although a Spanish translation appeared in 1892. Signor Caddeo would thus have performed a useful piece of work if he had done no more than render the text more accessible; but he has also produced the first critical edition of the 'Historie' ever published. He may be sincerely congratulated upon the manner in which he has discharged his task. His notes are adequate and scholarly, although he might perhaps have availed himself of the very valuable material collected by Miss Alicia Gould, who has made the subject of the companions of Columbus on his first voyage her own. The collation of the text of the 'Historie' with that of the 'Historia de las Indias' is particularly helpful; it may be hoped that a systematic comparison of the main sources for the life of Columbus will follow. Signor Caddeo gives an excellent bibliography.

Several appendices are devoted to a discussion of various Columbian problems. A convinced "Genovist," the author in the main accepts the "classical" version

of the story of the discovery and of the life of the discoverer. His criticism of those who have attacked that version are on the whole just, although it may be questioned whether Fernandez Duro was in fact actuated "per gelosia dell' italianità di Colombo." Little exception however need be taken to the further remark that some writers, in their desire to destroy the "Columbian legend," "hanno contribuito alla creazione della nuova *leggenda colombiana* che oggi corre il mundo e ha conquistato la *vulgar gente* di due emisferi, non solo con ponderose opere di scienza, ma con biografie romanzesche, tipo Marius André, e romanzi veri e propri, tipo V. Blasco-Ibañez."

As a solution of the difficulty presented by the well-known passage: "Io navigai l' anno M.CCCC.LXXVII nel mese di Febrraio oltra Tile isola cento leghe, la cui parte Australe e lontana . . ." Signor Caddeo suggests that the original Spanish ran: "Yo navegué, el año de 477, en el mes de hebrero, (*á*) *otra* Tile, isla (*de*) ciente leguas, cuya parte austral dista. . . ." He finds a parallel for "otra Tile" in the expression "Esta otra Española" in the 'Letter' describing the first voyage. He takes this expression to refer to Cuba, as, indeed, it would, at first sight, seem necessary to do. But when the context of the passage in the 'Letter' is examined, it seems to become clear that it was not of Cuba that Columbus was speaking, but of Española. While, indeed, the proposed emendation is interesting, it cannot perhaps be sustained, and it may be suggested that a simpler solution of the difficulty is supplied by the supposition that "leghe" is merely an error for "miglie." In the extant letters of Columbus it appears to be almost certain that more than once "leguas" has been written for "millas."

In his Introduction, Signor Caddeo deals with the vexed question of the authenticity and reliability of the 'Historie.' He argues that the testimony of Las Casas suffices to prove that Ferdinand Columbus did write a life of his father in Spanish, and he holds that this original has, in all essentials, been accurately preserved in the Italian translation by Alfonso Ulloa, there being neither serious omissions nor interpolations. He rejects the view of Vignaud that the Columbian character of the 'Historie' renders it suspect, declaring that the work was carefully compiled from the papers of the Admiral and the personal recollection of the author. "Le 'Historie,' " he says, "non sono adunque ne apocrifè, ne apologetichè, ne menzoggerè." It may be questioned whether this estimate is not somewhat too favourable and whether the question of the real character of the 'Historie' has yet been finally answered. But that the work is an important source must be admitted, and all students of the life of Columbus have been placed under a very real obligation by Signor Caddeo, whose edition will be indispensable to them. C. J.

CAPTAIN JAMES COOK, R.N.: ONE HUNDRED AND FIFTY YEARS AFTER. By Sir JOSEPH CARRUTHERS. (With Forewords by Admiral Sir DUDLEY R. S. DE CHAIR and by the Rt. Hon. W. M. HUGHES.) *London: John Murray* 1930. 8×5 *inches;* xx+316 *pages; illustrations, facsimiles, and map.* 7*s* 6*d*

The eulogies of James Cook's work and character—unanimous, world-wide, and well deserved—which characterized the celebration of his bi-centenary two years ago, have made most people forget (if many of them ever knew) that immediately after his death there was no such unanimity of praise. At that time an uncomfortable suspicion was abroad that Cook had in various ways contributed to his own death by unduly harsh treatment of the Hawaiian tribes, by neglect of their tabus, and by accepting a deification that he could not sustain. These suspicions derive mainly from the journals of a certain John Ledyard, who got his account of Cook's last voyage before the public three years earlier than the Admiralty's

official narrative of 1784. When once this narrative was read, Ledyard's stories faded out of the English memory.

But Ledyard was a New Englander, and at the end of 1782 deserted from the British Navy and went back to Hartford, in Connecticut, where his family lived. There he re-wrote his journal, which was promptly published and ran through several editions. Republished, with a Life of the author, in 1828, it seems to have become in the United States an accepted authority on Cook's last voyage; a good deal of its narrative was incorporated by an American missionary in a 'Hawaiian History' which he compiled in 1838 from material furnished by native students; and from this Ledyard's charges against Cook were repeated as authentic history in many Hawaiian and American books. Consequently Sir Joseph Carruthers, visiting Honolulu in 1924 and mentioning Cook as an illustrious link between Australia and the Hawaiian group, was astonished to find himself out of sympathy with his auditors. "As a matter of fact," said one of them, "Cook and his crew behaved badly, committed great excesses contributing to his death, and left behind a trail of evils which have affected the Hawaiian race ever since. There is no reason why Cook's memory should be venerated here."

The core of the book under notice—chapters v–xviii—consists of a very careful and well-documented examination of these astonishing charges and the sources from which they were originally derived, constituting a complete refutation of Ledyard and his unwary followers. For this every admirer of James Cook owes a debt of gratitude to the author, who has other claims on their gratitude but none greater than this. Ledyard himself, it is shown, was merely a corporal of marines, devoid of personal knowledge on most of the events he chronicles, and by the admission of his own American editors prone to exaggeration and of defective memory. The material drawn from Hawaiian students in 1838 is confronted with material gathered from eye-witnesses of Cook's death by an earlier missionary, William Ellis. The confutation is direct, detailed, and indisputable. And the statues with which Sydney in 1879 and London in 1914 honoured the great navigator are now joined by a monument erected in 1928 at his first landing-place in the Hawaiian group. It should be added that both the later memorials owe their origin to Sir Joseph's advocacy.

It is unfortunate that the author of such valuable work has chosen to prefix to it four chapters of far less historical value. In them he endeavours to prove (*a*) that Cook was ordered by his "Secret Instructions" to search for the Australian coast; and (*b*) that French Governments were in those years and for a good many years after contemplating annexations in the Australian region. The Secret Instructions undoubtedly refer to a "southern continent," which was, of course, the *Terra Australis Incognita* that Cook proved to be a myth. As for French annexations, it has been made clear by half a dozen recent writers (notably by Professor Ernest Scott) that no French explorers in the South Seas before the days of Louis-Philippe had any official orders—and very few of them any personal desire—to annex territory so far from home. As for the story that La Pérouse escaped from Vanikoro and was in the end wrecked on the Barrier Reef, it is less worthy of credence than even Ledyard. Sir Joseph will do well to cancel the first four chapters in any future edition of his book.

A. J.

THE ROMANCE OF NAVIGATION. By Captain W. B. WHALL. Edited by FRANCIS E. MCMURTRIE. Foreword by Rear-Admiral E. R. G. R. EVANS. *London: Sampson Low, Marston & Co.* [N.D.] 9×6 *inches;* xii+244 *pages; and illustrations.* 6*s*

Captain Whall has covered an immense area over which those of whom he writes have sailed "In every kind of bark, From a liner to the Ark." And indeed in vessels built before that remarkable construction, of which it may be said he gives some description. No name of any important traveller is omitted in the early chapters, and though it cannot be said that he adds anything original to the characters or feats of those redoubtable men, it may well be that such a galaxy will attract the attention of those who wish to study their exploits in greater detail.

The chapters on Polar Exploration are well written and show that this branch of exploration has seized upon the imagination of the writer. Some pages are devoted to the search for hidden treasure: romance perhaps, if not navigation; and if it encourages others to spend their money in fruitless search no great harm will be done.

There are many illustrations, several of them excellent. The fact that they have nothing to do with the letterpress contiguous to them is perhaps inevitable.

It is a question if the title of the book is well chosen. W. E. G.

OBITUARY

CAPTAIN WILLIAM COLBECK, R.N.R.

Captain William Colbeck, R.N.R., who died on October 18, was a pioneer in Antarctic exploration.

Born in Hull in 1871, he was educated at Hull Grammar School and went to sea as an apprentice at the age of fifteen. He took his Master's extra-certificate in 1897. In 1898 Mr. C. E. Borchgrevink succeeded in persuading the publisher Sir George Newnes to purchase and refit a Norwegian whaler, renamed the *Southern Cross*, and to bear the whole expense of an expedition to the Antarctic seas. Colbeck, who was chief officer of the *Montibello* (Wilson Line) at the time, volunteered for service with the expedition, and after going through a course of magnetism at Kew Observatory under Dr. Charles Chree, joined the *Southern Cross* as navigator, cartographer, and assistant to the magnetic and meteorological observer. He proved to be an accurate and intelligent observer, and during the forty-five days that the *Southern Cross* was caught in the Antarctic pack-ice he acquired considerable experience in ice navigation. He was one of the small party to spend the first winter ever passed by human beings on the Antarctic Continent, at Cape Adare in lat. 71° 18′ S.—a winter which proved to be terribly severe. Fierce blizzards of altogether unexpected fury were experienced. On the return of the *Southern Cross* to Cape Adare in 1900 she proceeded south to the vicinity of Mount Erebus and steamed close in over nearly the whole length of Ross's Ice Barrier, which enabled Colbeck very accurately to plot its position and to prove that the whole of this enormous wall of ice (500 miles in length) had receded an average of 30 miles since Ross's voyage in 1842.

A landing was effected on the Ice Barrier near its eastern extremity, and the then record of lat. 78° 50′ S. reached by Borchgrevink, Colbeck, and Bernacchi over the Barrier surface. The scientific results of the *Southern Cross* expedition

were published by the authorities of the British Museum and by the Royal Society in 1902.

In 1902 Colbeck was appointed by Sir Clements Markham to command the relief ship *Morning* in connection with the National Antarctic Expedition in the *Discovery* under Captain R. F. Scott, R.N. In the words of Markham, "Colbeck had proved that there could be no better man to perform the duties which the command of the *Morning* entailed." He received his commission as Lieutenant R.N.R., and was awarded the Back Grant by the Society for his former services in the Antarctic regions. He was particularly fortunate in getting together some most excellent officers and some old shipmates of the lower deck. The *Morning* sailed from New Zealand on 6 December 1902, crossed the Antarctic Circle on Christmas Day in long. 179° 30′ E., and on the same day discovered two small islets which were named Scott Islands. Proceeding south, at Cape Crozier the record was found announcing the position of the winter quarters of the *Discovery* in McMurdo Sound, and the members of the *Morning* were soon in touch with Captain Scott. Fourteen tons of provisions, etc., were transported over 6 miles of ice to the imprisoned *Discovery* with efficiency and speed before the *Morning* returned to New Zealand at the beginning of March.

Colbeck with the *Morning* and a second ship, the *Terra Nova*, returned in January of the following year with arrangements complete for taking all the *Discovery's* officers and men on board, if necessary, but fortunately the *Discovery*, after being gripped in the ice of McMurdo Sound for two years, freed herself from her fetters on February 16 and was enabled in a somewhat damaged condition to return to New Zealand with the relief ships.

On his return to England the Council presented Colbeck with a silver cup, designed by Markham to symbolize his voyages in the *Morning*, engraved with the texts, "Joy cometh in the morning," and "We bring you in the morning bread to the full."

Colbeck's love and admiration for Captain Scott was deep and sincere, and to the day of his death Scott was his ideal of what an Englishman should be and could do. The numerous references to Colbeck in the 'Voyage of the *Discovery*' indicate the high esteem for his character and admiration of his splendid seamanship held by Captain Scott. Colbeck was of a somewhat modest and retiring disposition, but when occasion arose he could express himself in no uncertain tone and in moments of difficulty and danger could be relied upon to act with coolness, courage, and great determination. L. C. B.

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First Evening Meeting, 3 November 1930. The President in the Chair

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Paper: The Hejaz. By Mr. Eldon Rutter (4th "Asia" Lecture)

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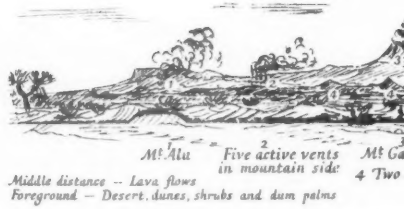
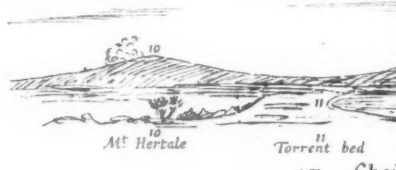
By L. M. Nesbitt

13. *Panorama looking north from Realu Plain. 12 June.*

16.

14. *Near view of black flat-topped volcanic cones of recent origin near Adaito Waterhole. 12 June.*





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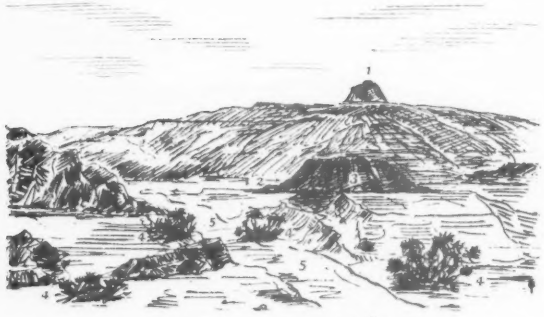
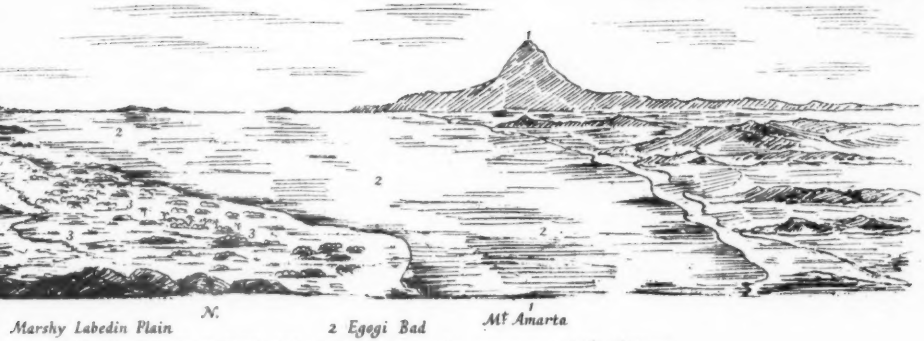


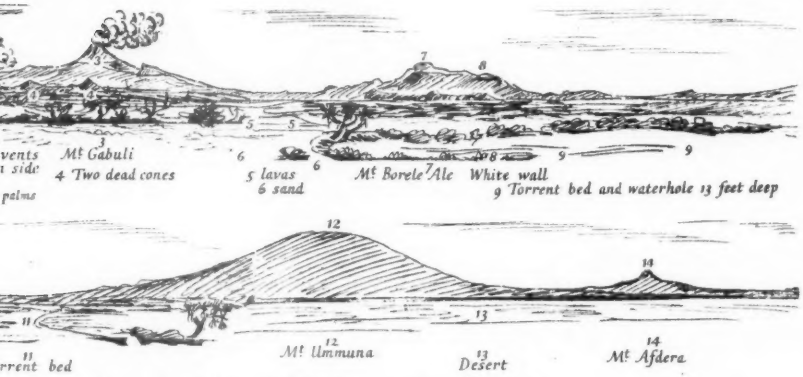
15. *Mount Afdera from camp beside Adaito Waterhole. 12 June.*

18. *Monumental tomb at Agulio. 5 June.*

Published by the Royal Geographical Society



16. Egogi Bad (salt lake) from basalt spur of Mt Afdera, one hour after leaving Adaito Waterhole. 13 June.



17. Chain of active volcanoes east of route from Hebehela Waterhole. 20 June.

19. Tombs at Agulio. 5 June.

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THE RECLAMATION OF THE ZUIDER ZEE. *By Professor J. W. Thierry*

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THE EAST AFRICAN LAKES. *By Mr. L. S. B. Leakey*

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TO LAKE CHAD AND THE SAHARA. *By Mrs. Patrick Ness.*

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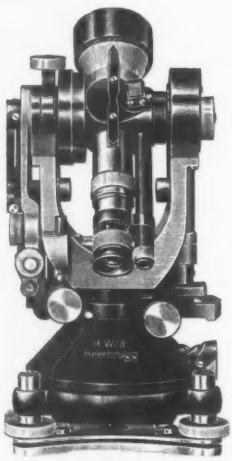

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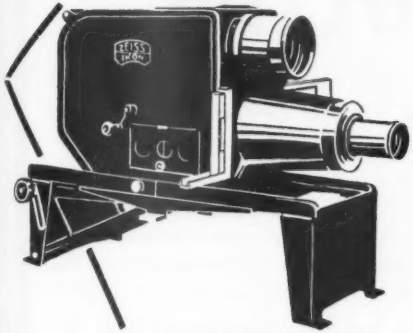

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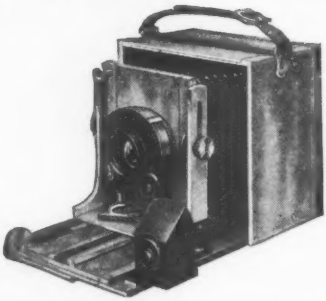

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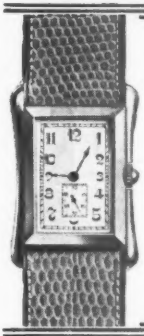

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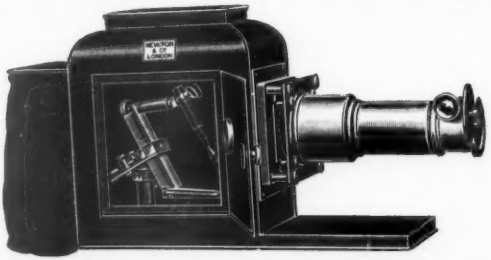

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